BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

Vol. XLII 1910 No. 3

THE TECTONIC LINES OF THE NORTHERN PART OF THE NORTH AMERICAN CORDILLERA

BY

W. JOERG

[Map facing p. 178.]

The geographic world is to be congratulated on the completion of Eduard Suess's monumental work "Das Antlitz der Erde." The final volume*, published in October, 1909, in Suess's seventy-eighth year, is a splendid proof of the undiminished vigor and freshness of this master-mind. American geographers in particular will welcome the publication of the final volume, as it contains a summary of our present knowledge of the structure of North America, the completeness of which is only made possible by the investigations and surveys which have taken place since the publication, in 1885, of the volume of Suess's work which first treated of North America.

The following sketch, together with the accompanying map, is an attempt to present in outline the structural features of the northern part of the North American Cordillera, based mainly on Suess, but in part also on Brooks's valuable geography of Alaska† and on various reports of the geologic surveys of Canada and of the United States.

THE CORDILLERA. The North American Cordillera‡ is that

* Das Antlitz der Erde von Eduard Suess. Dritter Band, zweite Hälfte. Wien und Leipzig, 1909. A short review will be found in Petermann's Mitteilungen, vol. 56, p. 41 (Jan. 1910).

† The Geography and Geology of Alaska...by A. H. Brooks. Prof. Paper 45, U. S. Geol. Survey, 1906.

‡ The singular form is here used, although a decision rendered on February 6, 1907, by the United States Geographic Board prescribes the plural (a reversal, however, of its previous decision), as, irrespective of its original Spanish meaning of "mountain chain," the word is intended to denote a regional *unit*.

major geographic province of North America which occupies the Pacific side of the continent and is bounded on its outer side by the Pacific Ocean and on its inner side by the great central trough of the continent. It is preëminently a highland region and extends, from northwest to southeast, from the westernmost of the Aleutian Islands* and the mainland of Alaska to the Isthmus of Tehuantepec, at which, structurally, North America ends. The western rim of the great central trough with which the eastern border of the Cordillera is contiguous is, in its constituent parts, composed of the following sub-provinces, beginning in the north: (1) the Arctic Slope of northern Alaska, descending to the Arctic Ocean; (2) the basin of the Mackenzie River; (3) the Great Plains and, in the south, (4) the Gulf Coast, descending to the Gulf of Mexico.

The North American Cordillera, north of a depression passing south of the San Bernardino Mountains, between them and the San Jacinto Mountains (San Gorgonio Pass, 2,560 ft.), through the Salton Sink and along the Gila River and the Rio Grande—which limit separates from it its southern portion, Lower California and the Mexican Highland—is longitudinally divided into three zones which, named in order from the Pacific Ocean towards the interior of the continent, are: (1) the Pacific Mountain System; (2) the Central Plateau Region; (3) the Rocky Mountain System.

CONTINUATION OF ASIATIC STRUCTURE. Such are the generally recognized sub-provinces of the Cordillera. Suess, while accepting these in principle, establishes his own divisions, being guided mainly by the structural and geologic point of view, which often leads to different results than the orographic.

According to Suess, the type of structure prevailing in northeastern Asia is continued in northwestern North America. The characteristics of the peripheral arcs of Asia recur in Alaska. The tectonic lines of the "Okhotides" [Ochotiden]†, consisting of the Aldan Range (bordering, in part, the western shore of the Sea of Okhotsk), of the Lesser Khingan Range, of the Sikhota Alin, on the western shore of the Japan Sea, and of Sakhalin Island, together with the meridional range of western Yezo, furthermore, the axes of the "Anadyrides," to which belong the Verkhoyansk Arc from its northwestern end on the right bank of the delta of the Lena to its junction with the merging ends of the Aldan and

* Bering Island, of the Commander Islands, here so considered.

† An analogy, in English, of this rendering of the German form of the suffix is to be found in the Laurentides of the left rim of the St. Lawrence valley. It has also been adopted in the English translation of Suess's work by H. B. C. Sollas. (Cf. *Bull.* Am. Geogr. Soc., vol. 41, p. 588).

Stanovoi Ranges, the Stanovoi Range itself, and, finally, the Kurile-Kamtchatka Arc—all of these tectonic lines find their counterpart in the ranges of Alaska, to which Suess has applied the name of "Alaskides." The Alaskides have, in common with the Okhotides, Anadyrides and other peripheral arcs of Asia, both the characteristic convergence of their axes and the impingement at right angles of some of these axes upon others. Thus, the Kamtchatka-Kurile Arc impinges upon the Sakhalin-Yezo Arc in the same manner as the Aleutian Arc, in its turn, upon the Kamtchatka-Kurile Arc.

But the influence of Asiatic structure is not confined to the Alaskides alone. According to Suess, this influence persists, on the western side of the Cordillera, through the St. Elias Range to its southern end at Cross Sound, and on the eastern side of the Cordillera to no less an extent than through the whole eastern front of the Rocky Mountain System to its disappearance in the southern end of the Sierra las Vegas, or Santa Fé Range, between Santa Fé and Las Vegas, N. M.

THE ALASKIDES. The constituent parts of the structural features of the Cordillera, exclusive of Lower California and the Mexican Highland, will now be considered in detail, beginning with the Alaskides in the northwest and gradually progressing to the southeast.

To the mountain ranges of Alaska Suess has applied the name of Alaskides. The Alaskides represent a virgation or radiating ramification, which diverges towards the west and converges to the east. The western portion of this radiation is drowned; its main lines are revealed by the intervening ingression of the sea, viz.: Kotzebue Sound, Norton Sound, Bristol Bay and Shelikof Strait, together with Cook Inlet. To the east the Alaskides are limited by a zone included between the 146th and 147th meridians, where they coalesce with the Pacific and Rocky Mountain Systems, as will presently appear. Three structural axes represent the main lines of this virgation. They will be named, from north to south: Romanzof* Axis (so called by Suess), Alaska Range Axis, Kenai-Kodiak Axis.

(a) ROMANZOF AXIS. The Romanzof Axis represents an arc, concave to the north, whose eastern end probably lies in about 68 1/5° N. and 147° W. near the interlocking headwaters of the Middle and East Forks of the Chandlar River with those of the

* After N. P. Romanzof (1754–1826), who fitted out Kotzebue's exploration expedition to the Pacific Ocean 1815–18. The name is also borne by the cape midway between the mouths of the Yukon and of the Kuskokwim and by one of the minor ranges paralleling the Romanzof Axis to the north, possibly between 142° W. and 146° W. (Cf. Brooks, Op. cit. p. 44).

Canning River, although certain other passages in Suess (iii, 2, p. 450) seem to indicate that he might also consider it to lie further to the east, possibly in 140° W. From here the arc sweeps to the west and terminates in Cape Lisburne; its continuation, Suess believes to be found in northeastern Siberia and in the New Siberian Islands with their predominating north-northwest trend.

The Romanzof Axis embraces the Endicott Range, the De Long Mountains, the Baird Mountains and the Waring Mountains.

The Endicott Range constitutes the main part of the Romanzof Axis; it may here be considered as extending from the eastern end of the latter to the interlocking headwaters of the Noatak and Kobuk Rivers.

The De Long Mountains are an outer, northern branch of the Endicott Range and terminate in Cape Lisburne, while the Baird Mountains, between the Noatak and Kobuk Rivers, and the Waring Mountains, south of the latter river, represent southern branches.

(b) ALASKA RANGE AXIS. The Alaska Range Axis begins south of the upper Tanana River at the Nabesna River and swings in a mighty curve, convex first to the north and then to the south and roughly 2,500 miles long, through the Aleutian Islands to their western end. It includes—if, in keeping with Suess's postulate with regard to the naming of mountain ranges, soon to be mentioned, we consider the Alaska Range as beginning at the Delta River—the following: Mentasta Range, Alaska Range, Chigmit Mountains, Aleutian Range, Aleutian Islands.

The Mentasta Range lies between the Nabesna and Delta Rivers and is a direct continuation on the southeast of the axis of the Alaska Range. It, in its turn, is continued to the southeast by the Nutzotin Mountains, which may be considered as ending at Kluane Lake. The Alaska Range sweeps in a bold curve, convex to the north, from the Delta River to the northern end of Lake Clark. It carries the highest summit of the continent, Mount McKinley, 20,300 ft. in elevation. Overlapping its southwestern end on the inner side lie the Chigmit Mountains*, which form a connecting link between the Alaska Range and the Aleutian Range. They seem to have the tendency to develop longitudinal valleys. The Aleutian Range forms the axis of the Alaska Peninsula and lies on its Pacific side. It extends from Cape Douglas, where its northeastern end is offset to the east with reference to the axis of the Chigmit Mountains, to Unimak Pass in the southwest. From here

* Brooks, *op. cit.* p. 33 and Plate VII.

the chain of the Aleutian Islands extends, in its structural axis, to Bering Island of the Commander group.

(c) KENAI-KODIAK AXIS. The Kenai-Kodiak Axis is here considered to begin at the Copper River, from which it extends parallel to the Alaska Range Axis and includes the Chugach Mountains, the Kenai Mountains and Afognak and Kodiak Islands.

The Chugach Moutains enclose Prince William Sound to the north in an arc concave to the north; the transverse depression of Turnagain Arm and of an east-west fiord of Port Wells, which confine the Kenai Peninsula at its neck, may be considered their southwestern limit. From here the Kenai Mountains, lying on the oceanic side of Kenai Peninsula and forming its backbone, trend to the southwest and find their continuation in Afognak and Kodiak Islands with an offset to the east similar to that which the Aleutian Range undergoes with reference to the Chigmit Mountains.*

INTERVIRGATIONAL STRUCTURE. The Seward Peninsula probably also represents a branch of the virgation† and undoubtedly constitutes a connecting link, structurally, between North America and Asia. But evident as is this connection in the general relationship, yet it is difficult directly to determine the same between the Seward Peninsula and the Chuckchee Peninsula of Siberia, of which the former is doubtless a continuation. This difficulty lies in the fact that the Seward Peninsula is less a region of well-marked tectonic lines than one of local intrusions of various geologic periods.

The Yukon Hills, south of the Koyukuk River, the Gold Mountains, between the Melozi and Yukon Rivers, and the Kaiyuh Mountains, paralleling the Yukon on the left along its south-southwestern course may be considered as minor ramifications of the virgation, included between its major axes.

The Kuskokwim Mountains, of plateau-like character and with a general southwestern trend, possibly crossed by the Kuskokwim River in 62° N., together with their southern continuation, the Ahklun Mountains, terminating in Cape Newenham, Suess does not consider as a branch of the virgation; they are an extraneous element.

COALESCENCE OF THE ALASKIDES. To the east the Alaskides are limited by their coalescence [Scharung]‡ with the ranges of the Pacific and Rocky Mountain Systems. This coalescence takes place

* Caused by a zone of fracture of northwest strike from Kamishak Bay to the passage between Afognak Island and Kenai Peninsula? W. J.

† Cf. varying statements in Suess III, 2, p. 395 and p. 426.

‡ Rendered by "syntaxis" in the translation by H. B. C. Sollas.

in a zone extending northward from Prince William Sound, between 146° W. and 147° W. to the Arctic Ocean. To this coalescence, Suess has given the name of Coalescence of Chugach* after the Innuit appellation of Prince William Sound, a form still retained in the name of the Chugach Mountains. To the west of this coalescence the general trend of the mountain axes is southwest, gradually changing to west-southwest and finally west-northwest in the northern (Romanzof) branch of the Alaskides; to the east of the coalescence the general trend is southeast. All of the important ranges of the interior are to a certain extent subjected to this influence, which is most conspicuous on the coast of the Pacific Ocean, where the tectonic lines meet nearly at right angles, enclosing the Gulf of Alaska.

The Alaskides coalesce in their southern branch, the Kodiak-Kenai Axis, with the Pacific Mountain System to the north of Prince William Sound where, as the Chugach Mountains, they imperceptibly merge into the St. Elias Range.

With the Rocky Mountain System the Alaskides coalesce in their central and northern branches, the Alaska Range Axis and the Romanzof Axis, respectively. The Alaska Range does not directly merge with the main axis of the Rocky Mountain System, as is the case in the southern coalescence, but their two respective ends overlap. The Alaska Range with its southeastern continuation, the Mentasta and Nutzotin Mountains, comes into lateral contact with the northwestern end of the main axis of the Rocky Mountain System, which terminates in 147° W. between the small Chena River and the Tanana River, the latter forming the division between the two axes.

The coalescence of the northern branch of the Alaskides, the Romanzof Axis, with the eastern axes of the Rocky Mountain System is considered to take place either in 147° W. or 140° W., according to which view is entertained with regard to its eastern end, as referred to above.

According to Suess it seems probable that a fault zone separates the Mentasta Range from the Nutzotin Mountains and another the Chugach from the Kenai Mountains, the former with a northwest-southeast strike, the latter with a northwest-southwest strike, reflecting the trend of the axes on both sides of the zone of coalescence.

Alaskides a Tectonic Unit. To Suess, the Alaskides represent a tectonic unit. Every coalescence exhibits the result of two oppos-

* "Tschugatsk" in the original.

ing dynamic influences. Therefore, it should be considered a boundary, and, accordingly, the name of no mountain range should be extended beyond it. Thus, for the Alaskides, Suess cannot accept Brooks's tripartition into Pacific Mountain System, Central Plateau Region and Rocky Mountain System. He nevertheless recognizes the great similarity of axial structure on both sides of the zone of coalescence, and he appreciates the factors that have led to the extension into Alaska of the subdivisions of the Cordillera in the United States and Canada. Indeed, his assumption of the persistence of Asiatic structure in the Rocky Mountains involves the recognition of this similarity, which is visible in the analogy of arrangement and of direction of folding between the respective outer and inner axes of the Alaskides and of the ranges to the southeast of the zone of coalescence. On the one hand, namely, the outer arcs of the Alaskides (Kodiak-Kenai and Alaska Range Axes) are concave to and face the Pacific Ocean, the direction of folding being toward it, while, on the other, the inner arc (Romanzof Axis) is concave to and faces the Arctic Ocean, being folded towards the north; both find their counterparts in the St. Elias Range, which faces the Pacific and is folded toward it, and in the eastern ranges of the Rocky Mountain System, which face towards the interior of the continent and are folded toward the east.

St. Elias Range. The St. Elias Range, which does not belong to the Alaskides but lies to the east of the zone of coalescence, extends from the Copper River to Cross Sound. It forms a high, rugged coastal barrier, attaining extreme elevations in its culminating peaks (Mount Logan 19,500 ft., Mount St. Elias 18,024 ft., Mount Fairweather 15,387 ft.). Between its base and the coast lies a shelving coastal plain, at times 20 to 30 miles wide and in many places covered by huge glaciers.

Provisional Character of Nomenclature. The terminating limits of mountain ranges and axes, as given in the above, should, of course, be merely considered as tentative. Even Suess's statements do not always allow of a definite conception of the extent of the various ranges, a fact which is quite comprehensible in view of the conflicting condition of the nomenclature of the region under consideration, due on the whole to—at least for such purposes—inadequate knowledge concerning the objects to be named. This at times leads even to a divergence of conception in the works of the same author, as expressed in the text or on the accompanying maps. Furthermore, even ample knowledge of a mountain region does not

always insure an indisputable delimitation of its component parts, as witness the problem of the boundary between the Alps and the Appennines, still awaiting a solution satisfactory to all.

THE "INTER-MOUNTAINS." All of the ranges to the west of the zone of coalescence belong to Suess's system of the Alaskides. To the southeast of this zone and enclosed between the St. Elias Range on its western and the Rocky Mountain System on its eastern side lies the beginning of one of the nine major structural provinces* into which Suess has divided the "face of the earth"—a province to which he gives the name "das Zwischengebirge," here provisionally rendered by "the Inter-Mountains." It extends obliquely through the whole Cordillera from its Pacific to its Atlantic side, *viz.:* from the zone of coalescence to the Sierra Madre del Sur, on the southern rim of the Mexican Highland, through approximately forty-three degrees of latitude. It is bounded on the west by the St. Elias Range, the "Vancouver Axis" mentioned below, the Coast Ranges of the Pacific Coast of the United States (which represent the beginning of Andine structure), Lower California, the Sierra Madre del Sur; on the east by the Rocky Mountain System, where, in the south, the outer scarp-rim of the Wasatch Mountains and the Colorado Plateau form its eastern boundary. It includes the Wrangell Mountains, the Skolai Mountains, the Alexander Archipelago, the Coast Range and the Interior Plateaus of British Columbia, the Cascade Mountains, the Sierra Nevada, the granitic areas of Oregon and Idaho, the ranges of the Great Basin and the Mexican Highland, as which it reaches the Gulf of Mexico. It is therefore amply evident that it does not coincide with any of the recognized subdivisions of the Cordillera; it includes portions of the Pacific Mountain System, the greater part of the Central Plateau Region and even parts of the Rocky Mountain System, as will appear. The principles underlying its delimitation are structural and geologic, not orographic or topographic. Its structural relation to the other provinces cannot be dwelt upon here. As a unit it is characterized by pre-Carboniferous formations, by old intrusive rocks, by folding and faulting and by recent vulcanism.

CONSTITUENT PARTS OF THE INTER-MOUNTAINS. The Wrangell Mountains are a well-defined group of, in part, still active volcanic mountains of roughly elliptical shape, 100 miles long and 70 miles broad, and with west-northwest and east-southeast trend. On the northeast they are separated from the Mentasta Range and the

* Suess, III, 2, pp. 573 seq.

Nutzotin Mountains by a well-marked depression continuing the upper valley of the Copper River across the transverse valleys of the Nabesna and Chisana. To the northwest and southwest they are enclosed by the bend of the Copper River, the lower part of which is continued to the southeast by the Chitina River.

Mesozoic rocks, which form the southern base of the Wrangell Mountains, chiefly compose the Talkeel Mountains,* a group with southwestern trend that lies between the Matanuska River on the south and the upper Sushitna on the north. As the Aleutian Range on its Pacific side also consists of Mesozoic rocks, the Talkeel Mountains, geologically at least, may be considered as a connecting link between the Wrangell Mountains and the Aleutian Range.

Between the Alaska Range and Mentasta Range on the north, the Wrangell Mountains on the east, the Chugach Mountains on the south, the Talkeel Mountains on the west, lies the Copper River Plateau, an extensive level tract of about 2,200 ft. mean elevation.

To the southeast the Wrangell Mountains are continued by the Skolai Mountains which trend southeast and merge with the St. Elias Range. The Skolai Mountains afford a typical example of the still prevailing conflicting nomenclature. Brooks would seem to consider them as lying to the south of the Nutzotin Mountains, between these and the Wrangell Mountains, and forming a connecting link between the eastern continuation of the Alaska Range and the St. Elias Range† and so indicates them on Plate VII, while R. U. Goode's map of Alaska‡ accompanying the same report interprets them in the above sense as a southeastern continuation of the Wrangell Mountains, in concurrency with Suess.

Eruptive rocks occur in the greater part of the Alaska Range Axis from the Aleutian Islands through the northwestern longitudinal half of the Alentian Range to the Chigmit Mountains and embrace furthermore the main massif of the Wrangell Mountains. In fact, the Wrangell Mountains, although not geographically connected, may be considered a northeastern continuation of the volcanoes of the Aleutian chain. According to Suess, this is the only known case of a coalescence being accompanied by a line of active volcanoes (Wrangell Mountains).

In their northwestern part, the Inter-Mountains comprise the

* Cf. Brooks, *op. cit.* Plate XXI.

† Brooks, *op. cit.* pp. 29, 31, 32, 34, 35, 36, 255.

‡ Map of Alaska compiled under the direction of R. U. Goode by E. C. Barnard and others. 1:2,500,000. contours; interval 1,000 ft. The excellent reduction to 1:5,000,000 with much additional information, relief in shading and lowland below 1,000 ft., in green tint, published as Plate I, *Petermann's Mitteilungen*, 1907, should also be consulted.

Alexander Archipelago. Here occur large areas of massive igneous rocks, chiefly of effusive origin,* which may be considered as extensions from the main body of the batholith.

The Inter-Mountains further comprise an intrusive batholith of great length to which Suess has given the name of [British] Columbian Granodiorite. It extends through fourteen degrees of latitude from 63° N. to just south of the boundary between Canada and the United States. It is practically coextensive with the Coast Range of British Columbia and embraces the entire area, colored to indicate "coast granite" on the "Western Sheet of the Geological Map of the Dominion of Canada" (scale 1:3,171,000), published by the Geological Survey of Canada, with the exception of a narrow zone of sedimentary rocks which occupy the coast from the head of Lynn Canal to Dixon Entrance.† It extends in a belt increasing in width from 30 miles at 141° W. to 100 miles in the south, from the northern front of the Nutzotin Mountains, across the Naberna and the upper White River, past Lakes Kluane and Dezadeash, paralleling the coast as far as the bend of the lower Fraser. Here the batholith retreats from the coast and dwindles to a narrow end, which projects to the south of the Canada-United States boundary and forms the nucleus of the Skagit Mountains, which lie to the west of the upper Skagit River, being crossed by its middle course, and constitute a subdivision of the northern end of the Cascade Mountains.

Here, superimposed on the granite, begins, with Mt. Baker, the meridional line of andesitic volcanoes of the Cascades which extend nine degrees to the south and include Lassen Peak. South of Lassen Peak the Cascade Mountains are continued by the Sierra Nevada. Both the Cascade Mountains and the Sierra Nevada form a part of the Inter-Mountains.

To these also belong Dawson's Interior Plateau of British Columbia.‡ It lies between the Coast Range and the Rocky Mountain System and extends, with a length of 500 miles and an average width of about 100 miles, from Babine Lake southeast to just south of the Canada-United States boundary in the Okanagan Valley. In early Tertiary time it had been base-leveled to a peneplain. This peneplain "has never since been entirely obliterated, although . . . it has been an area of deposition of strata and the theatre of

* Brooks, *op. cit.*, p. 226.

† Cf. Brooks, Plate XXI.

‡ Cf. *inter alia*. Annual Report Geol. Surv. Canada, vol. VII (new series), 1894, pp. 4–9 B.

great volcanic eruptions."* According to Suess, this Tertiary peneplane lies horizontally over the north-northwest trending and folded rocks of the Inter-Mountains.

The eastern boundary of the Interior Plateau, as far as determined, may be taken with Daly† to follow in its salient features the Quesnel River, Adams Lake and the Kettle River. To the east of it lie the orographic units established by Daly which, according to the definition of the Rocky Mountain System here entertained, belong to this major subdivision of the Cordillera. Suess, however, includes in the Inter-Mountains the western half of Daly's Columbia System, the unit lying immediately to the east of the Interior Plateau, so that here their eastern boundary lies approximately along the western base of the Gold Range, a subdivision of the Columbia System and, possibly, along the North Fork of the Kettle River and Christina Lake (118 1/5° W.). This important tectonic boundary between the Rocky Mountain System and the Inter-Mountains is marked by no structural feature of note; no fault line separates the two divisions.

In the south the Inter-Mountains are represented by the granite area of Oregon and that of Idaho. To the former belong the Blue Mountains which, although separated from it by the basalt through which the Snake River has eroded its canyon, are technically continuous with the granite mass of Idaho. The latter, a post-Triassic intrusive batholith of a width, at times, of 100 miles, includes in the north the meridional section of the Bitterroot Mountains south of Lolo Pass, which separates the granite from the Algonkian sedimentary terrane of Lindgren's "Cœur d'Alene Mountains"‡ to the northwest. On the east, this part of the batholith is bounded by the fault of the Bitterroot Valley, which, according to Suess, separates it from the Rocky Mountain System. A division based on orographic principles, however, would place the western limit of the latter farther to the west, at the eastern edge of the Columbia Lava Plain and the Snake River Basalt, thus including the Bitterroot Mountains, while the Bitterroot Valley, from the point of view of this classification, represents merely a boundary between subdivisions. In the south the eastern edge of the batholith extends as far as Hailey (114¼° W.; 43½° N.); its southern front continues west-southwest and includes the Owyhee Mountains.

* Ibid., p. 5, B.

† R. A. Daly: The Nomenclature of the North American Cordillera between the 47th and 53rd Parallels of Latitude. *Geogr. Journ.*, vol. 27 (1906, 1), pp. 586–606. Map, p. 588.

‡ W. Lindgren: A Geological Reconnaissance across the Bitterroot Range and Clearwater Mountains in Montana and Idaho. U. S. Geol. Surv., Prof. Paper 27, 1904.

These various subdivisions of the Inter-Mountains, viz.: the Cascades, the Blue Mountains, the granite batholith of Idaho, although isolated, are structurally one, their connecting parts having been overflowed and obscured by the Miocene lava flows which created the Columbia Lava Plain and the Snake River Basalt.

Western Boundary of Inter-Mountains. To the west the Inter-Mountains are, it will be remembered, bounded by the St. Elias Range, the "Vancouver Axis," the Coast Ranges, Lower California and the Sierra Madre del Sur. The St. Elias Range has been previously referred to, while the two last mentioned parts of the western boundary of the Inter-Mountains are not included in the scope of the present discussion.

The "Vancouver Axis" embraces the Queen Charlotte Islands and Vancouver Island. According to Suess, they are not a continuation of the Alexander Archipelago, but an independent mountain system similar to the Inter-Mountains and lying to the west of them.*

The Coast Ranges of the Pacific Coast of the United States—which should, of course, not be confused with the Coast Range of British Columbia from which they are entirely distinct—are characterized by an *échelon* alignment of their axes, which is typical of the structure of the Pacific Coast, beginning with the Queen Charlotte group and extending far to the south.

Inter-Mountains Not a Geographic Province. Such, then, is the extent of the Inter-Mountains. In conclusion it may be stated that, as justifiable as is their establishment as a unit from the structural point of view, yet a division, based on geographic principles, cannot recognize them as a natural province. The above considerations as to their nature and extent do not, therefore, modify the system of subdivisions of the Cordillera suggested at the beginning of this paper.

Rocky Mountain System. There remains to be discussed a major subdivision of the Cordillera, the Rocky Mountain System. According to Suess its northern end is marked by its coalescence with the Alaskides; in the south it has previously been defined as extending to the Rio Grande. Whether, however, the mountain ranges of the region, enclosed by the Pecos and the Rio Grande, above its confluence with the former, should not be excluded from the Rocky Mountain System because of the similarity of their habitus to that of the ranges of the adjoining portion of the Mexican

* III, 2, p. 466. Cf., however, conflicting statement on p. 467.

Highland will, in the present paper, be left an open question. Suess inclines to this view* and considers this region as a spur of the Inter-Mountains. Powell, on his map of the physical divisions of the United States,† also classifies as a separate province the "Pecos Plateaus," which embrace a part of the region under consideration, while Davis‡ includes it in the equivalent of the Rocky Mountain System.

On the east, the Rocky Mountain System is bounded by the great central trough of the continent in its contiguous parts, the Mackenzie Basin and the Great Plains, as before stated. On the west it is bounded by the Central Plateau Region. The eastern limit of the latter, which coincides with the eastern limits of its subdivisions, will evidently be the western boundary of the Rocky Mountain System. This boundary has before been roughly indicated with respect to its northern and central subdivisions, the Interior Plateau of British Columbia and the Columbia Plateaus (as the central subdivision will here be termed, in keeping with Powell's and Davis's classification;§ it includes, therefore, the Columbia Lava Plain, Snake River Basalt and the greater part of Suess's granitic mass of Idaho). The question as to the eastern boundary of the southern subdivisions of the Central Plateau Region must also, for the time being, be left unanswered. Some of the points to be decided in this connection may, however, be indicated. They are, whether, on the one hand, the Wasatch Mountains (which undoubtedly form the eastern boundary of the Great Basin), together with the region which lies between them and the Rocky Mountains of Colorado and south of the Uinta Mountains—the drainage basin of the lower Green and Grand Rivers and of the upper Colorado—and, on the other, the Colorado Plateau, should both be considered as belonging either to the Central Plateau Region or to the Rocky Mountain System. If the basin of the lower Green and Grand Rivers, the Colorado Plateau and the region between the Rio Grande and the Pecos, be not counted in the Rocky Mountain System, then, in its southern portion, it would be bounded on the west by the western base of the Rocky Mountains of Colorado and on the south by the upper San Juan River and the Rio Chama, and would finally come to a tapering end in 35° 30′ N. as the Santa Fé Range, previously referred to.

---

* III, 2, p. 491.

† J. W. Powell: Physiographic Regions of the United States. National Geographic Monographs. Vol. I, No. 3 (pp. 65–100), 1895. Map on pp. 98–99.

‡ The International Geography, edited by H. R. Mill, 1909. Map p. 719.

§ Maps of *Op. cit.*

CONTACT WITH PACIFIC MOUNTAIN SYSTEM. To the north of the east-west course of the Columbia River in 48° N. the Rocky Mountain System and the Pacific Mountain System come into contact for about one degree of latitude, thus separating the Central Plateau Region into two halves, the Interior Plateau of British Columbia lying to the north, the Columbia Plateaus to the south of the zone of contact. Probably the Okanagan Valley below Osoyoos Lake (49° N.) represents the boundary between the two systems.

CHARACTERISTICS. The general trend of the ranges of the Rocky Mountain System is southeast—varying at times to south-southeast—from its coalescence with the Alaskides in the north to about 42° N. where the Laramie Range bends to the south. From this point southward the Rocky Mountain System, as a unit, assumes a meridional trend.

A characteristic of the ranges composing the Rocky Mountain System, which persists throughout its entire extent, is their alignment *en échelon*, i. e., the arrangement of a series of roughly parallel ranges in such a manner that the end of one projects beyond the end of the next, so that their front presents a step-like ground plan. This arrangement is particularly evident in the eastern front of the system, especially in the portion with meridional trend. Here the north-south axes have the tendency to bend to the north-northwest at their northern ends and to form a virgation. Their main trunks, however, with their north-south trend, preserve the straight front of the whole system towards the Plains. But, due to their *échelon* character, this continuity of their front is interrupted by reentrant angles at every merging of the southern end of one range with the northern end of the next. Suess here distinguishes four axes which are aligned *en échelon* to each other: (1) the Laramie Range; (2) the Medicine Bow Range and the Front Range; (3) the Park Range, the South Park Range and the Wet Mountains; (4) the Sawatch Range, the Saugre de Cristo Range, the Culebra Range and the Santa Fé Range.

Arrangement *en échelon* is also evident on the western side of the Rocky Mountain System. The ranges lying between the basin of the upper Green River and the Snake River Basalt show the same tendency as those of the eastern front to bend towards the northwest, at the northern end of their meridional axes, until they disappear under the basalt floods of the Snake River basin.

TWO LONGITUDINAL BELTS. The Rocky Mountain System, in its northern portion, may be considered to consist roughly of two

longitudinal belts, an inner (with reference to its relative position in the Cordillera) or western and an outer or eastern one.

It is to the outer belt that the name "Rocky Mountains" has always unreservedly been given. It is only with growing recognition of the fact that the Rocky Mountains are merely a part of a larger system that their name, in the form of "Rocky Mountain System,"* has been extended to include the whole system. And this is only just, inasmuch as the part with which a definite conception was first associated—because of the westward movement of exploration and settlement and, in part, because of the well-defined character of, at least, its eastern boundary—should give its name to the whole, after it has once been recognized as a part of that whole. On the other hand it does not seem conducive of greater clarity of conception to withhold the name of Rocky Mountain System from the whole mountainous belt lying between the Interior Plateau of British Columbia and the Great Plains, as some Canadian geologists do, especially as the terms they are constrained to resort to, such as "the Rocky Mountains proper" or "the main range of the Rocky Mountains," for what is here designated the Rocky Mountains (the eastern belt) seem to indicate a feeling that the name is associated with a larger conception than that corresponding to the outer belt alone.

The boundary between the inner and outer belts of the Rocky Mountain System, as far as determined, is represented by a remarkable longitudinal depression which extends for over 800 miles from the head of the Liard River to Flathead Lake, Montana. The streams flowing in it drain it, in general, alternately in opposite directions, indicating the absence of a continuous gradient. They are, from north to south: Kachika River (flowing N.W.), Tochieca River and its trunk stream, Finlay River (both S.E.), Parsnip River (N.W.), upper Fraser River (N.W.), Canoe River (S.E.), upper Columbia River (N.W.), upper Kootenay River (S.E.), lower Tobacco River (N.W.) and Stillwater River (S.E.), which flows into the Flathead River, a short distance above its emptying into Flathead Lake. The continuation of this trough to the south may possibly be found in the depression accompanying the western foot of the Mission Range and in the Bitterroot Valley. To this dominant

* Daly uses this term (*Op. cit.*, p. 592 and p. 604) to designate what is here called the outer or eastern belt. It may be added that he wishes the term "Pacific Mountain System," if at all used, applied as a variant for the Cordillera because of its being pre-eminently "a Pacific feature of the globe" (pp. 591 and 592). Davis uses "Rocky Mountain System" in the sense in which "the Cordillera" is here used (*Op. cit.*, p. 671) and designates by "Rocky Mountains" (Map p. 719) the equivalent of "Rocky Mountain System" in the present paper.

feature Daly has felicitously given the name of "Rocky Mountain Trench."* As to its structural significance, Suess is not willing to decide; the only at all comparable phenomenon is that of the "Scandinavian Line."†

WESTERN BELT NORTH OF 52° N. The axis of the inner or western belt of the Rocky Mountain System begins between the Chena and Tanana Rivers in 64½° N. and 147° W. and extends in an east-southeastern direction that gradually changes to southeast across the meridional course of the Yukon above the Klondike River, then, crossing obliquely the lower courses of the Stewart and Pelly Rivers, continues as the Cassiar Mountains across the Dease River, an affluent of the Liard, forms the backbone of the mountains lying to the west of the Finlay and Parsnip Rivers and, as the Cariboo Range, reaches the bend of the Columbia River in 52° N., where the Rocky Mountain System expands into a virgation to the south.

EASTERN BELT NORTH OF 52° N. The main axis of the outer or eastern belt of the Rocky Mountain System may be considered as beginning on the eastern side of the Yukon, between the Klondike and Tatonduk Rivers. From here to the interlocking headwaters of the Stewart and Gravel Rivers it is known as the Ogilvie Range.‡ It has an east-southeast trend. Continuing it on the east and extending to the southeast to an unknown distance lies the Selwyn Range.§ The Ogilvie and Selwyn Ranges carry the Yukon-Mackenzie watershed.

The Tanana Hills north of the lower Tanana (Suess's Ketchumstock Mountains?‖ may possibly be a western continuation of the Ogilvie Range. In this case they would represent the westernmost extension of the Rocky Mountain System.

Towards the Mackenzie the Ogilvie and Selwyn Ranges are limited by a scarp-like front which rises abruptly from the plateau below. This, together with the fact that the front is in part formed by the outermost of the sub-ranges trending parallel to the main range, has led to their being taken for the continuation of the main range of the Rocky Mountains. The average elevation of

---

* *Op. cit.* p. 596.

† The eastern boundary of the gneiss area of southwestern Sweden, extending through five degrees of latitude from the coast in 15° 20′ E. past the southern end of Lake Wetter, along the eastern shore of Lake Wener and up the Klar-Elv. Cf. III 1, p. 479.

‡ Cf. J. Keele: Upper Stewart River (Report C) and C. Camsell: Peel and Wind Rivers (Report CC), *Annual Report* Geol. Surv. Canada, vol. XVI (new series), 1904.

§ R. G. McConnell: The Macmillan River. *Annual Report* Geol. Survey Canada, vol. XV (new series), 1902–03, p. 26A, and J. Keele's report.

‖ III, 2, p. 453.

2,000 to 3,000 feet for these frontal sub-ranges, as compared to that of 7,000 to 8,000 feet for the Ogilvie and Selwyn Ranges, should afford a criterion for their relative valuation. The Selwyn and Ogilvie Ranges are here considered the continuation of the Rocky Mountains or outer belt of the Rocky Mountain System. On the accompanying map, therefore, the lines bounding the Mackenzie Basin on the west should be interpreted as the limit of the mountainous region of which the Ogilvie and Selwyn Ranges represent the axes, and not as mountain axes themselves.

In 136° W. this scarp-like front, which, to the east of this point has an east-southeastern trend, suddenly swings due north and meets the delta of the Mackenzie, enclosing a large semicircular tract of a mean elevation of 1,700 feet, termed the Peel Plateau, and drained by the river of that name. On its approach to the Arctic Ocean the scarp-front bends to the northwest and then to the west, assuming the trend dictated by the coalescence. The scarp is here known as the Richardson, Buckland and Franklin Mountains. They probably bear to the Romanzof Axis the same relation as the scarp of the Mackenzie Basin to the Ogilvie and Selwyn Ranges. According to Suess, they represent the northernmost ranges with which the Rocky Mountain System coalesces with the Alaskides.

The heights accompanying the right bank of the Mackenzie and extending from its bend in 62° N. to its bend in 66° N. may also be considered as sub-ranges or outliers of the Rocky Mountain System.

To the south of the Liard River, where the mountains are again marshalled into a solid phalanx, the main axis of the outer belt, or Rocky Mountains, extends to the southeast across the upper Peace River, and the depression occupied by the headwaters of the Fraser and Athabaska Rivers, connected by Yellowhead Pass.

Western Belt South of 52° N. South of this region and the bend of the Columbia River, the Rocky Mountain System expands into a greater number of diverging ranges. In the inner belt, the Gold Range, with its continuation, the Colville Mountains, and the Selkirk Range, with its minor offshoots, the Slocan Mountains* and the Pend Oreille Mountains, about on the Columbia Lava Plain. Between the Selkirk Range and the Rocky Mountain Trench lies the Purcell Range. To the south these are continued on one side of Clarks Fork by the Bitterroot Mountains, on the other by the Cabinet and Flathead Mountains. Confusion prevails with regard to the limits of the Bitterroot Mountains. The United States Geo-

* Daly, *Op. cit.* p. 602 and Map p. 588.

graphic Board* includes under this term the entire range whose crest forms the boundary between Idaho and Montana, from Pend Oreille Lake to the crossing of the Oregon Short Line near 112° W. Lindgren† wishes the name restricted to the section between Lolo and Nez Percé Passes, while R. U. Goode‡ applied the name to the section between Pend Oreille Lake and South Pass, slightly farther south than Nez Percé Pass and at the head of the Bitterroot River.

Eastern Belt South 52° N. The outer or eastern belt of the Rocky Mountain System, south of the bend of the Columbia, is continued by the "Canadian Rockies" proper, by the Livingston and Lewis Ranges and the ranges accompanying them on the west: the Galton Range, the Swan Range and the Mission Range, the meridional axis of the latter forming an angle with the prevailing south-southeastern trend.

South of the bend of the Missouri River, and extending to the plateau of Yellowstone Park, the ranges of the outer belt undergo a decided change in character. Instead of the prevalence of long ranges of the folded type, aligned *en échelon,* which obtain to the north and south, this region is structurally distinguished by the presence of faults and dislocations which have created mountains of the block type. To this structural category belong the Big Belt Mountains, the Little Belt Mountains, with their continuation, the Big Snowy Mountains, the Bridger Range, the Snow Mountains, the Beartooth Mountains.

Rocky Mountain System South of 47° N. To the west of this zone lies the granitic mass between Helena and Butte, the mountains lying on the western side of Deerlodge Creek and those bounding the Bitterroot Valley on the east. To the south lie the Jefferson Range, continuing the Helena-Butte mass, the Madison Range and the Gallatin Range, continuing the Bridger Range.

On the west the plateau of Yellowstone Park is bounded by the Teton Range, which meets the ranges already referred to as bordering the Snake River Basalt *en échelon* to the east and forming a connection with the Wasatch Mountains, while on the east it is bordered by the Absaroka Range, which, with its continuation, the Owl Mountains, bounds on the west and south the Bighorn Basin, of which the Bighorn Mountains form the eastern rim.

Beginning with the Gros Ventre Range on the eastern side of the Snake River, just below its issue from Jackson Lake, the axis of the

* As "Bitterroot Range," decision of Feb. 6, 1907.

† *Op. cit.*

‡ Bitterroot Forest Reserve. Nat'l Geogr. Mag. Vol. IX (1898), p. 391.

THE TECTONIC

OF THE

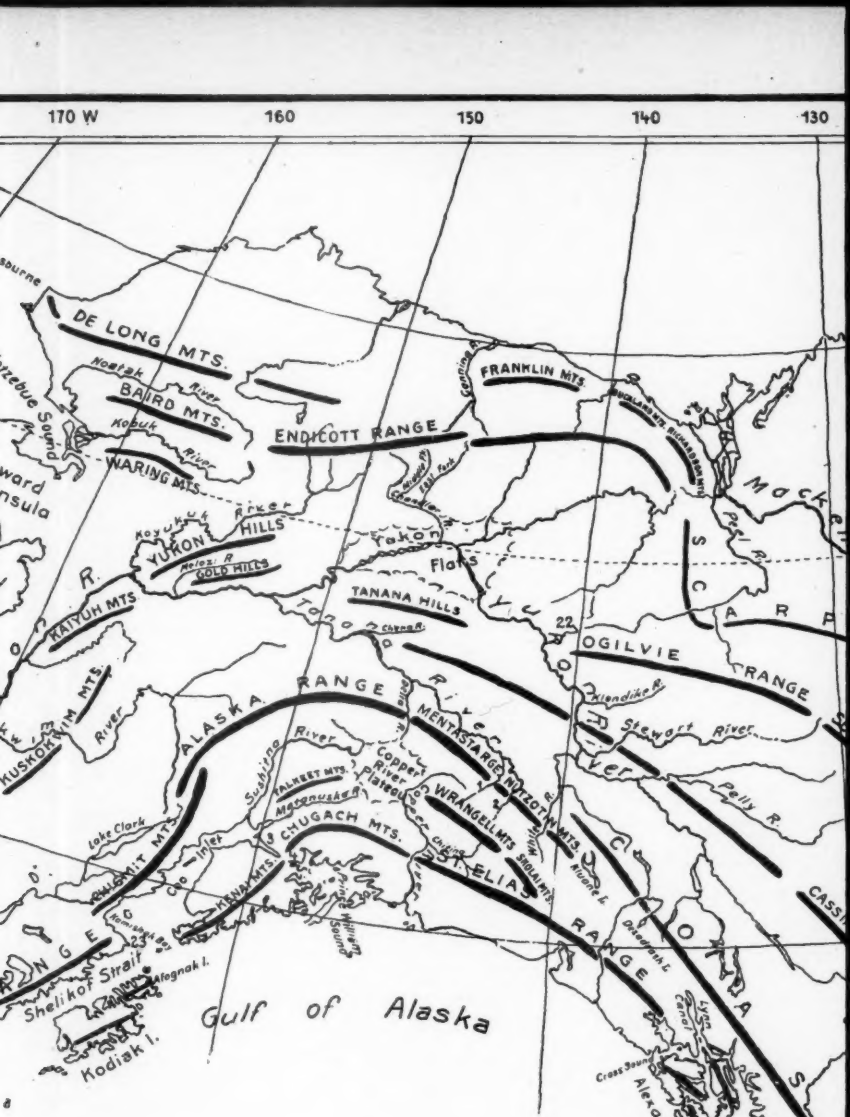
NORTHERN PA

OF THE

NORTH AMERICAN C

Based on Suess and oth

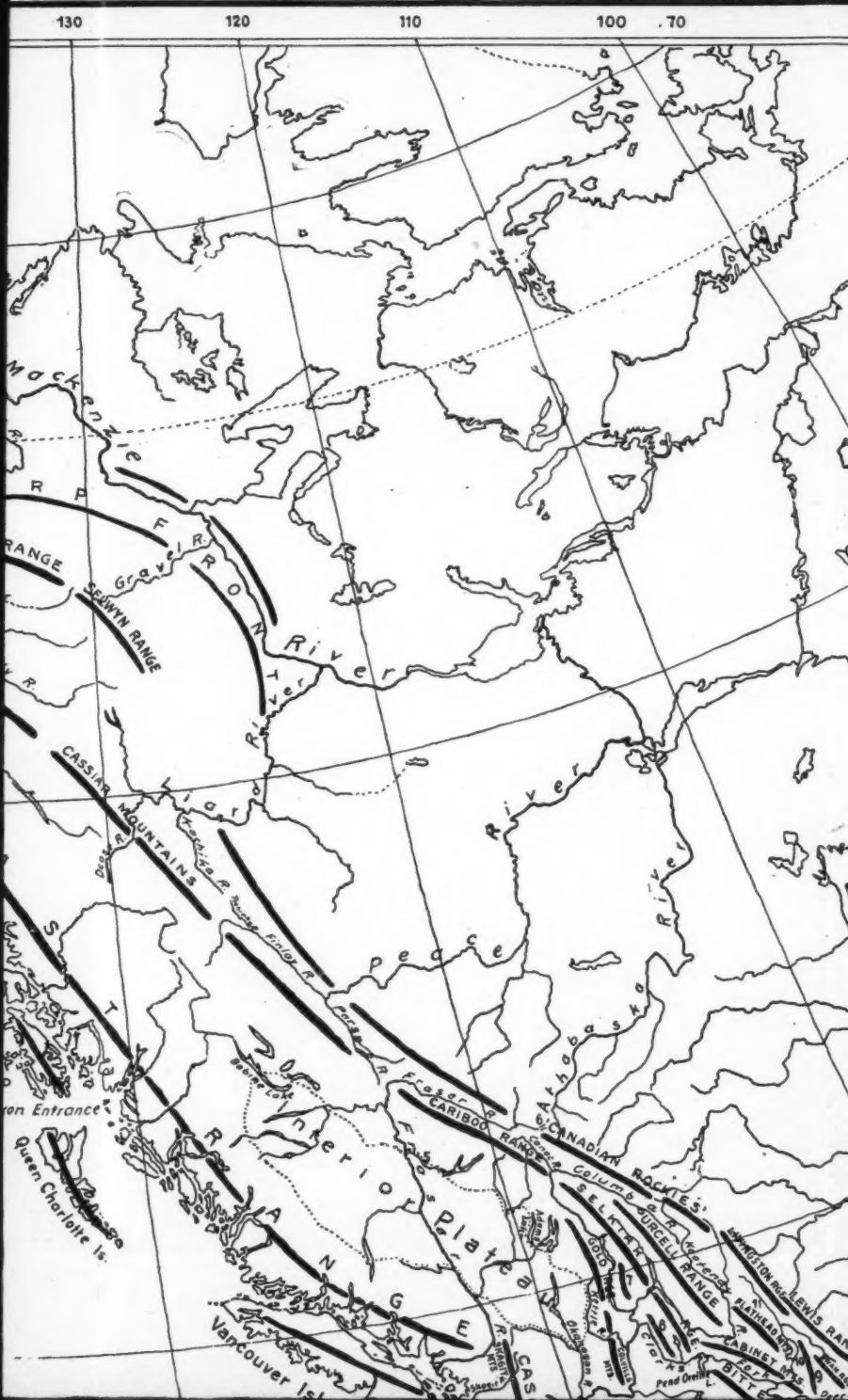
Compiled and drawn by W.

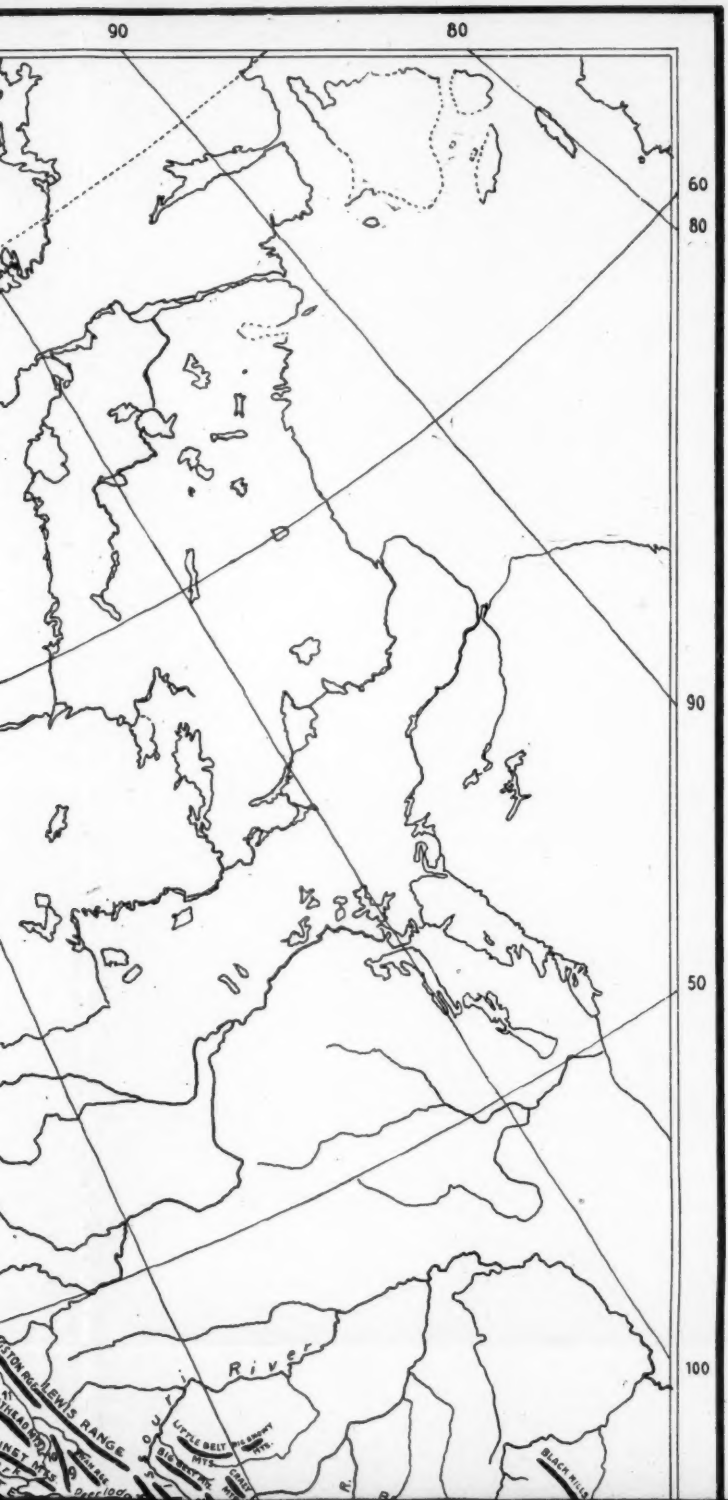


NIC LINES
HE
RN PART
HE
AN CORDILLERA

ss and others

wn by W. Joerg


130
120
110
100
70
Mackenzie
R
R
F
F
RANGE
Gravel R.
SELWYN RANGE
River
River
CASSIAR MOUNTAINS
Liard
Rocky Ridge
Finlay R.
Fraser R.
Peace
River
Athabaska
River
CARIBOO
RANGE
Columbia R.
CANADIAN ROCKIES
SELKIRK
PURCELL RANGE
Kootenay R.
Interior Plateau
Queen Charlotte Is.
Vancouver Isl.
Pend Oreille L.


90
80
60
80
90
50
100
River
LEWIS RANGE
LITTLE BELT MTS.
BLACK HILLS

THE TECTONIC L
OF THE
NORTHERN PA
OF THE
NORTH AMERICAN CO

Based on Suess and othe
Compiled and drawn by W. J
1910

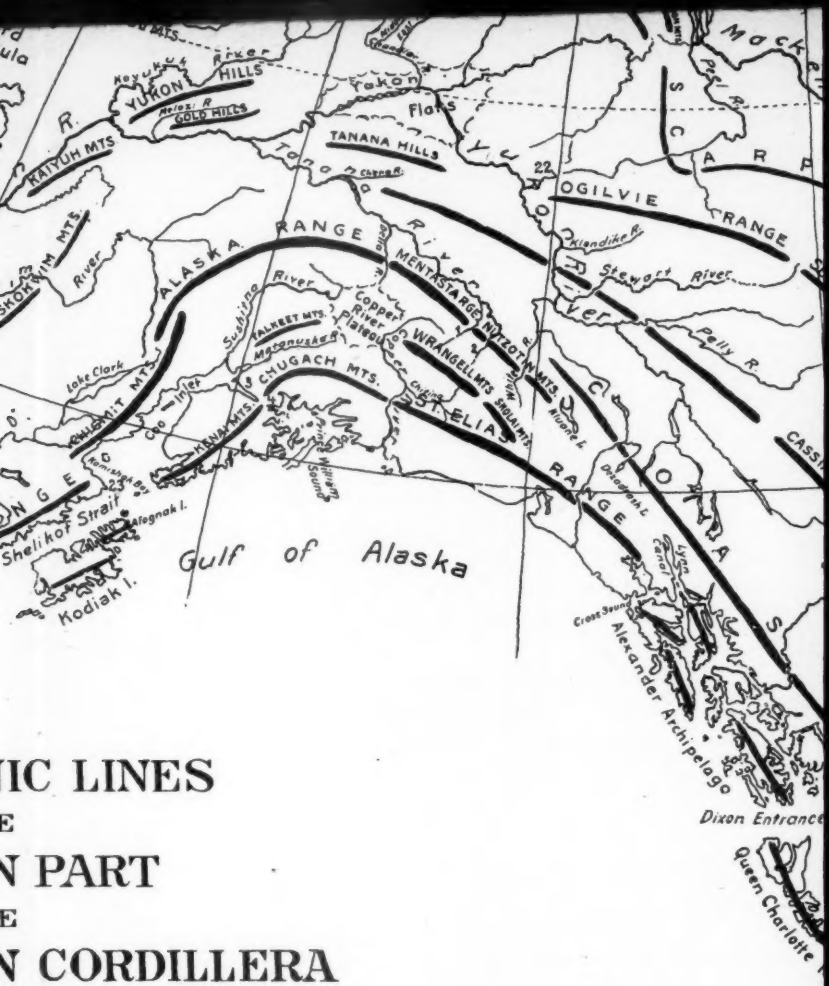
Scale:

100 0 100 200 30

Key to Numerals:

1. Nabesna R.
2. Chisana R.
3. Turnagain Arm
4. Port Wells
5. Quesnel R.
6. Yellowhead Pass
7. Slocan Mts.
8. Pend Oreille Mts.
9. Mission Rge.
10. Flathead Lake
11. Stillwater
12. Lolo Pass
13. Nez Percé Pa
14. Bitterroot R.
15. Helena - Butte
16. Jefferson Rge
17. Madison Rg
18. Gallatin Rge

Outline traced from Plate 179 - 180, Andrees Hand-Atlas 1905



IC LINES
E
N PART
E
N CORDILLERA

and others
by W. Joerg

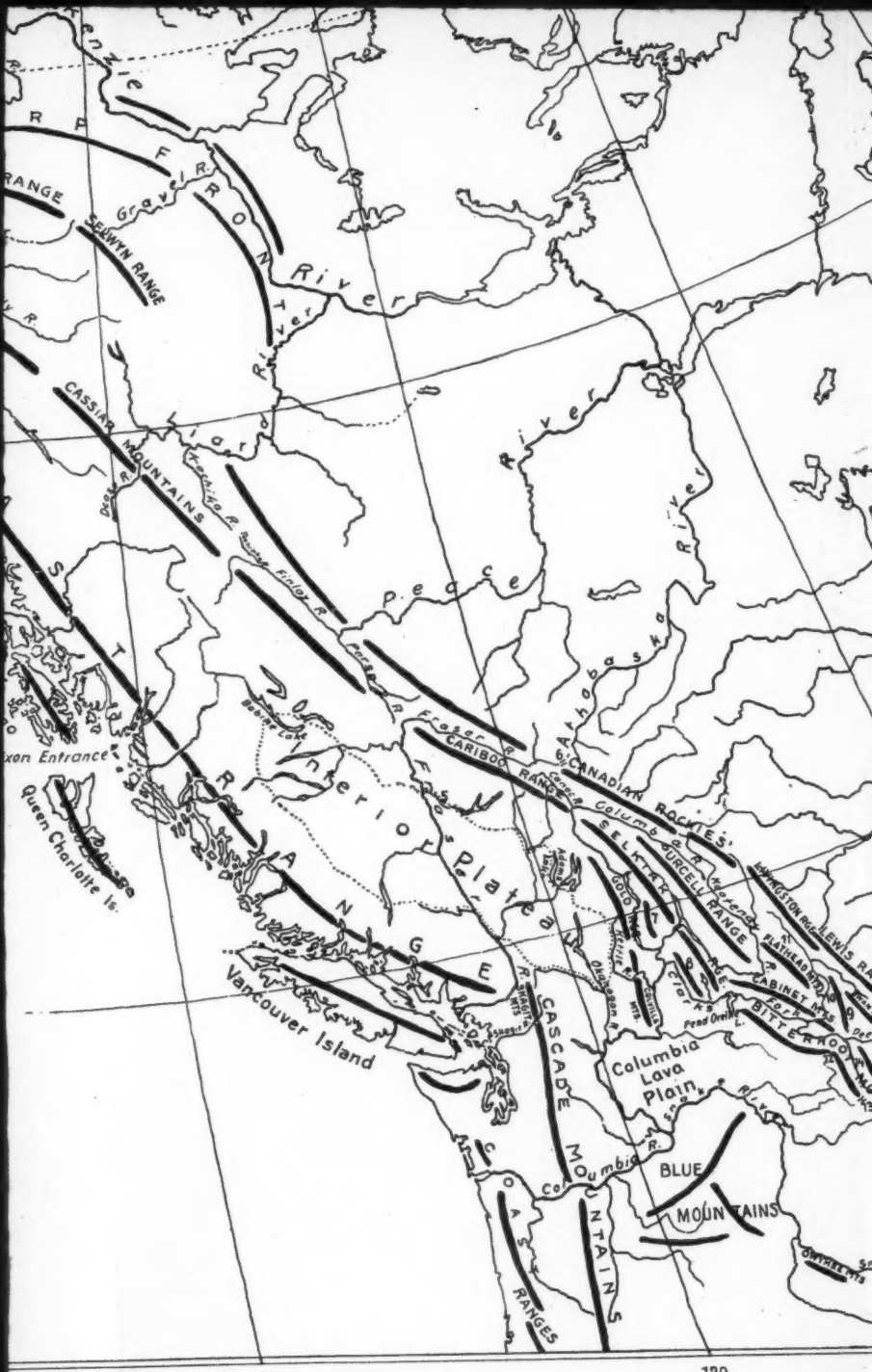
:

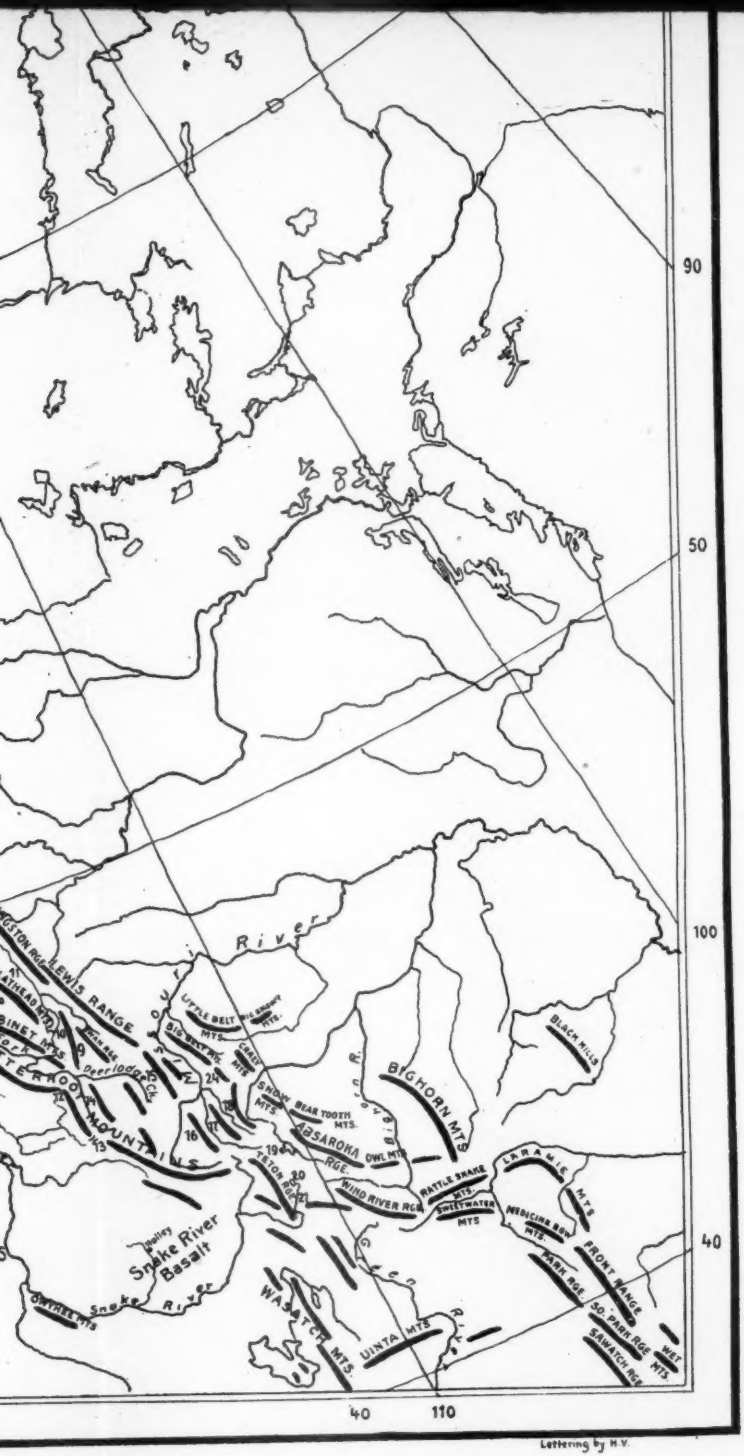
200 300 400 miles

erals:

ez Percé Pass
itterroot R.
elena-Butte Granite
efferson Rge.
Madison Rge.
allatin Rge.
19. Yellowstone Lake
20. Jackson Lake
21. Upper Snake R.
22. Tatonduk R.
23. Cape Douglas
24. Bridger Rge.

150 140


Mackenzie
R
R
F
RANGE
Gravel R.
SELWYN RANGE
RONTAL
River
River
CASSIAR MOUNTAINS
Liard
Peace River
Fraser R.
Fraser R.
Fraser R.
Athabaska River
CARIBOO RANGE
CANADIAN ROCKIES
Columbia R.
SELKIRK
PURCELL RANGE
Interior Plateau
Queen Charlotte Is.
Vancouver Island
CASCADE MOUNTAINS
Columbia Lava Plain
Columbia R.
BLUE MOUNTAINS
COAST RANGES
130
120



Lettering by H.V.

Wind River Range trends to the southeast and forks at its eastern end, where its northern branch, the Rattlesnake Mountains, forms the connecting link with the Laramie Range, previously mentioned, and its southern branch, the Sweetwater and Seminole Mountains, with the Medicine Bow Range, already alluded to. These ranges lead over to the mountains of Colorado.

CONCLUSION. REVISION OF THE SUBDIVISION OF THE CORDILLERA. Under the guidance of Suess we have thus obtained a rapid general survey of the North American Cordillera, north of the Gila and the Rio Grande, the unequal character of which is, in part, due to the inequality of our knowledge of the region and in part to limitations set by the present field of investigation of the writer.

In conclusion it seems worth while to reconsider the subdivision of the Cordillera into major geographic provinces, in the light of Suess's work, in order to ascertain whether a modification of the present scheme does not seem advisable. From this point of view the writer would suggest establishing the Alaskides as a separate province, of major rank as a subdivision of the Cordillera. The North American Cordillera, extending from Bering Sea to the Isthmus of Tehuantepec, would, therefore, fall into three major subdivisions: (1) the Northern Cordillera, or the Alaskides; (2) the Central Cordillera; (3) the Southern Cordillera, or Lower California and the Mexican Highland. The boundary between the first and second divisions would be the zone of coalescence, between the second and third the depression previously referred to along Salton Sink, the Gila and the Rio Grande.

The Central Cordillera would be further subdivided into three longitudinal provinces, viz.: (1) the Pacific Mountain System; (2) the Central Plateau Region; (3) the Rocky Mountain System.

In the north the Central Plateau Region would come to a tapering end, enclosed by the Alaska Range Axis and the axis of the inner belt of the Rocky Mountain System coalescing along the upper Tanana River. This delimitation differs from that of Brooks. It seems justified, however, as, even without establishing the Alaskides as a separate province, and even when considering the Central Plateau Region as extended to the west, between the Romanzof and the Alaska Range Axis, this province is so constricted at the point referred to that it naturally resolves itself into two halves. And, finally, the boundary between two opposing forces implied by every coalescence and the decided Asiatic structure of the Alaskides, would seem amply to justify the recognition of the Alaskides as an independent major subdivision of the Cordillera.

TRADE ROUTES IN THE ECONOMIC GEOGRAPHY OF BOLIVIA*

(*Concluded*)

BY

ISAIAH BOWMAN
Assistant Professor of Geography
Yale University

Paraguay-Santa Cruz

One of the oldest trade routes in South America is that from the plateau section of Bolivia to the Paraguay. Three facts have in the past restrained trade from following this route in increasing amounts. The Gran Chaco, across which the way lies, is insufficiently watered, except in its northern part. It forms an extension into Bolivia of the piedmont plains of Argentina, and its porus sands and gravels absorb the limited rainfall and thus diminish the value of the tributaries of the Paraguay for purposes of navigation. The flood plains are either inundated or too dry; the channels of the streams are marked in the dry season by innumerable snags and shallow and braided water courses. The hostility of the Indians of some sections of the region has been a second source of discouragement, while a third has been the directer course which the Amazon and its tributaries afford to European markets, besides their greater navigability at all seasons of the year on account of their location in a belt of heavier and more constant rainfall.

Repeated attempts have been made to develop some route to the Paraguay. Early in the history of the Spanish missions a cart road was opened to the present location of Santa Cruz, one of the most isolated cities in Bolivia to-day. Crevaux, the Stanley of South America, lost his life in 1882, in trying to explore the possibilities of the Pilcomayo.† Only in 1905-1906 was that river finally explored to the satisfaction of the Bolivian and Argentinian interests and found to be wholly unsuited to transportation on a commercial scale.‡ In 1879 Minchin§ opened up 50 miles of track through

* See *Bulletin*, January, p. 22, and February, p. 90.

† Süd und Mittel Amerika; W. Sievers, 1903, p. 29.

‡ The River Pilcomayo from its Discharge into the River Paraguay to Parallel 22° S. Gunnar Lange. Buenos Aires, 1907. See also El Comayo. S. V. Guzman. Buenos Aires, 1880.

§ Eastern Bolivia and the Gran Chaco. J. B. Minchin. *Proc.* Royal Geog. Soc. (London), vol. 3, 1883, p. 410.

dense, dry thorny scrub to the Parapiti from San José. No water could be found in all this distance, while borings to 26 feet were likewise unsuccessful. He describes the Indians as able to sustain themselves for long periods by the water found between the vertical

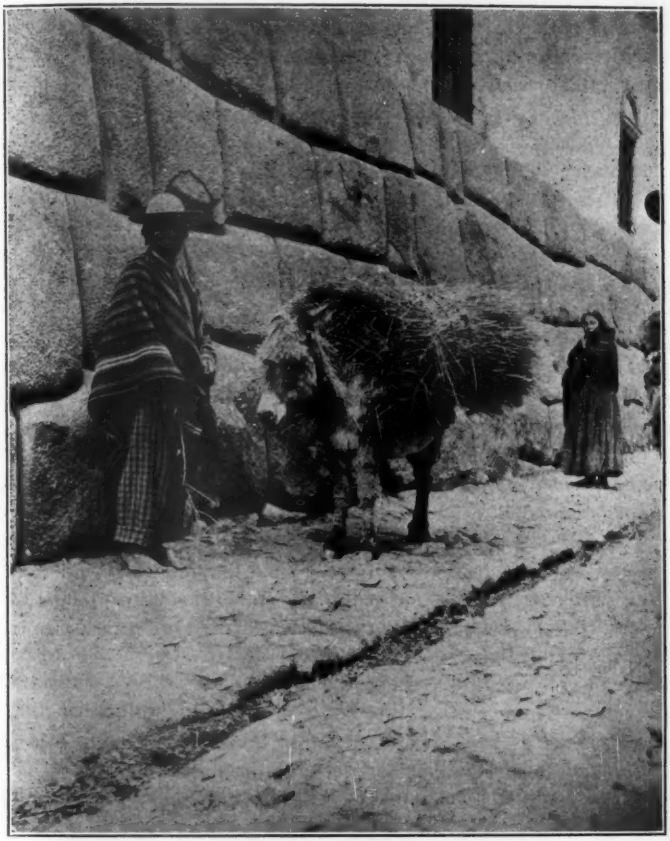


FIG. 16.
A common means of conveyance in Bolivia and Peru. Taken at Cuzco, 1907. Donkey loaded with straw used for fuel.

leaves of the cactus or that squeezed from large pulpy water potatoes.

The trade of the region is similar to that of the northerly regions of the Yungas and the Beni, with the addition of a greater amount

of hides, chocolate, and cinchona bark, and some products not produced farther north, such as sugar, rice, etc. The carrying has always been done more generally by ox carts than by mules. These are great, lumbering, uncertain vehicles, inexpressively slow, which follow not roads, but mere tracks 2 to 3 yards wide. While the superior navigability of the tributaries of the Mamoré has drawn much trade to the Amazon, some commerce persists toward the east and south. Even some rubber is shipped south from the Chiquitos and Mojos plains to Santa Cruz, to be taken by a one to two or more months' ox-cart journey of 400 miles to Corumbá, on the Paraguay. The return merchandise is of the general sort, already described, for the Chaparé. Insects, tigers and disease reduce the draught animals on the route and delay shipments. Rubber cargoes, following the loss of the draught animals, have in some instances lain two years beside the road awaiting shipment. Minchin states* that in the early '80's the rate from Santa Cruz to Corumbá, 400 miles,† was £43 per ton; from Santa Cruz to Cochabamba, 250 miles, or Sucre, 200 miles, £32; Santa Cruz to Jujuy (Argentina), 570 miles, £38 8s.; and from Buenos Aires to Corumbá, 1,500-1,600 miles (by steamer), £5 12s. What the Madeira falls have meant in money and toil to the traffic of the southwestern portion of the Amazon basin the unnavigable streams of southeastern Bolivia have meant, in an equal degree, to that section.

The increase in the cost of articles, conditioned by the mere transportation of them, is illustrated by the salt imported to the cattle farms at Trinidad and Villa Bella from the plateau of Bolivia. On the salars of the great central basin, the alti-plano, it is extremely cheap in its natural condition, in most cases absolutely free. Llama caravans convey it to Cochabamba, where it is shipped by mule caravan to Santa Rosa, at the head of navigation. Its cost on the plateau is, let us say, nothing, at Santa Rosa it is 15 cents gold per pound, and at Trinidad, a two weeks' journey below Santa Rosa, it is 30 cents gold per pound! The article is not only high-priced, but the cost is wholly due to the transport labor expended on it. High as is the cost of this commodity it is indispensable, not only to man, but to his beasts. The craving of tropical peoples for salt may be compared to that of temperate peoples for sugar, and in both cases is satisfied by the transportation of these products on a large scale

* *Ante*, p. 411.

† Distances here again are approximate, and are taken from Franz Germann's Mapa de la Republica de Bolivia, 1904; and from Andree's Allgemeiner Handatlas, 1904. They are more or less direct and if taken along the curves of the trail would be from 10 to 25 per cent. longer.

and often for great distances, even if primitive means are the only ones provided. Thus at the oasis of Taudeni, in the Sahara, 350 miles north-northwest of Timbuctu, are certain famous mines which produce great quantities of salt, that is shipped to the Niger valley, the cost increasing with every mile of the journey southward, and the same is true of the salt conveyed from the northern Sahara over the old caravan road from Tafilet. Lawes* mentions the same great craving for salt on the part of the natives of New Guinea, and numerous other instances might be cited from tropical lands where the great moisture prevents the accumulation of salt deposits.

The railroad development of the Gran Chaco region had its beginning in the extension of the Argentine lines to Corrientes on the Paraguay. In 1907 work was begun to extend this line up river toward Corumbá, while at Corumbá itself the line is being surveyed westward. The construction of this road has undoubtedly been stimulated by the coöperation of the American-Canadian syndicate, in connection with the São Paulo-Rio Grande railway in Brazil. Aside from the main lines near the coast or in the coastal provinces, there will be an extension 600 miles long into the interior of the country to Iguassú Falls, starting from the port of San Francisco. This line will open up Paraguay to the Atlantic by rail and by means of the Paraguayan railways, now existing or under concession, will connect with the new Bolivian railways ultimately to extend to Sucre, Santa Cruz and the Paraguay River at Corumbá. The considerations applied to the trade routes of the headwaters of the Madeira apply with only slightly diminished force to the southeastern route. The utilization of the water power of the mountainous border of the tableland and the stimulation of production afforded by improved transportation methods will mean the creation of new population groups and the rebirth of the old ones in the extensive and potentially wealthy grass lands of Chiquitos and adjacent provinces and in the fertile Andine valleys bordering them on the west. The completion of any one of these lines to the east, to Cochabamba or Sucre and the plains, would seem to be the most compelling project in Bolivia's entire plan for development. The enduring riches of that country—the fertile soil, the rainfall, the abundant pastures of her eastern basins, valleys and plains—these are in great measure shut off from the tableland above. This great trans-montane area has every favorable quality which the

* An Excursion in the Interior of New Guinea; W. G. Lawes, Proc. Royal Geog. Soc., vol. 15, 1883, p. 357.

plateau lacks, except its vernal climate; and the equalization of upland and lowland products, now carried on under extremest difficulties, would, through a railway, become easy and complete.

Sugar and rice would then come, not from the United States and Germany, but from Santa Cruz, where some quantities are now derived. Wood, the great lack of the alti-plano, both for fuel and lumber, would be in great measure accessible; and the products of the flocks and herds of the plains, now as sadly wasted on the plains as they are needed on the plateau, would find a ready market, to the great encouragement of the grazing industry. And the limits of that industry are only to be expressed in terms of the well-nigh boundless plains that would support it. For this southwestern section of Bolivia the greatest promise lies in such a railway from Corumbá to Santa Cruz. The greater width of the eastern Andes, in the latitude of Santa Cruz, excludes this city and region from early participation in the plateau railroad scheme. Its natural riches, however, make it one of the most promising portions of Bolivia. Both Minchin and Church, the two best authorities on the region, have recorded their enthusiastic belief in its bright future. Certainly every fact of its development at the present time points toward the confirmation of their results. In spite of the greatest difficulties, the region continues to grow, and to-day fairly demands an outlet to the Paraguay. A comparison of costs, labor supply and healthfulness with the Amazon route would favor Santa Cruz for shipments from the whole Chiquitos province. Its position at the northern end of the Gran Chaco gives it a climate which compares favorably with that of the plateau. It would be unthinkable that, so fortunately situated with reference to climatic belts, the Paraguay and the Atlantic, it would yet find an outlet to the Pacific over a trans-Andine railway. Steamers of 9-foot draught can now go to Asuncion and boats of 3-foot draught can reach Corumbá, 2,000 miles from Buenos Aires.*

Railroads of the Bolivian Tableland

The center of interest and of actual construction of strictly Bolivian railways is the plateau section between La Paz† and Oruro. The Bolivian government has contracted with the Speyer syndicate, of which Grace & Co. are the purchasing agents, and the National City Bank of New York the financial agents, to spend the $10,000,-

* *Ante*, p. 156.

† It would be more correct to say Viachi—the station a few miles out of La Paz on the La Paz-Mollendo line, which is the terminus of the Oruro line.

000 paid to it by Brazil in the building of over 300 miles of railway to cost $27,766,000. The difference between these two figures is to be covered by bonds upon the railways themselves. Half of the 300 miles is the line between La Paz (Viachi) and Oruro. The rest consists of branch lines to Cochabama, Sucre, Tupiza and Potosi. The Tupiza section will form a connection with the Argentine lines, the Cochabamba section will be an extension toward the plains, while serving the interests of one of Bolivia's four largest cities, and the Potosi line will eventually be extended to Sucre, which lies in much the same relation to the northern Gran Chaco as Cochabamba does to the Yungas territory. From Sucre

FIG. 17.

Drove of llamas loaded with Oregon flour starting on a two week's journey from Challapata to Sucre, Bolivia.

the natural continuation to Santa Cruz, thence across the Gran Chaco, via San José and the present ox-cart track, to Corumbá, the northernmost camp of the Brazilian lines, extended to and beyond Paraguay from the Brazilian coast at San Francisco. These lines have been "located" as far as Tupiza, Cochabamba and Potosi, and grading has been completed over the basin portion of the Potosi line, and for 30-40 kilometres from Oruro toward Cochabamba.

The immediate service of this important connection is apparent from a glance at the map of Bolivia. The two existing lines to

Bolivia are from coast ports 600 miles apart, while the land termini are 150 miles apart. Now 150 miles of land transport between the only two existing railways is an effectual bar to any system of partial transport over both lines. A mine or a store, located upon one or the other of the lines, was subject, without redress, to the prevailingly high tariffs that have marked the operations of these lines. This has been the history of railroad after railroad in South America. Every one has been characterized by a single track from the coast. Without competing trans-continental routes, without competition or even the barest chance of it in the coast valleys or upon the plateau, rates but slightly lower than those upon cart transportation to the coast, or in the case of the more remote locations, all that the old and the created traffic would bear, could be charged with the full knowledge that they would be paid. A railroad under these circumstances has been more profitable* to exploit than the incredibly rich mines it served or the wealthy sugar and cotton plantations it in some cases revived and in others created. A single figure will suffice to illustrate the point; the cost of the Arequipa-Puno section of the Southern Railway in Peru, completed from Mollendo to Puno, on Lake Titicaca, in 1874, was 6,400,000 pounds sterling.† Improvements and extensions have, of course, been made. These and the repairs will raise that figure considerably. The dividends paid to stockholders in 1906-1907 on the account of the railway above are not available, but the general statement of the account of the Peruvian Corporation owning the railway is as follows:‡

> The accounts of the Peruvian Corporation for the year ended June 30, 1908, show a profit of £263,203, after deducting the usual charges and interest on the debentures at the rate of £4 per cent. per annum. The board proposes to place £50,000 to reserve, making a total sum of £575,000 to the credit of that account; to make up the debenture interest for the year to the rate of £6 per cent. per annum (by payment of £2 per cent. additional interest on April 1st, 1909); to pay on Jan. 16th, 1909, a dividend of £1 10s. per cent. on the preference stock, amounting to £111,710; to write off £4,280 on colonization account and £2,269 in respect of income tax, and to set aside, as in previous years, £4,000 toward the insurance fund on the lake steamers. These provisions will absorb the abovementioned profit of £263,203, and, in addition £17,056 from the balance of net revenue shown in the previous year's accounts.

The importation of American goods is assured by the building

* Many of the railways were financially embarrassed for the first years of their existence, but so far as known all have soon become singularly profitable undertakings.

† Railways in Peru. The Geog. Mag. (London), vol. 1, April, 1874, pp. 36-41.

‡ *South American Journal*, Dec. 5, 1908, p. 640.

of this connecting line, inasmuch as the purchasing agent is an American concern, better acquainted with the prices, qualities and conditions of shipment of American goods. Their business growth at Oruro and La Paz has been nothing short of phenomenal, and while this is owing in part to their importation of railway material, it is also to a marked degree owing to the prestige which the house has gained through its relation to the railway and the general business thus secured. It is doubtful if any event in recent years has meant so much for our trade with Bolivia as the construction of this short railway by an American concern, with its stimulating effect upon the American business house associated with it. Although the effect is by no means confined to construction supplies, yet it is most marked there. The influence of the American has extended to the other railways of Bolivia and Peru. The new rails used for replacement on the Southern Railway of Peru are made in Pittsburg; over a hundred new modern-type engines recently installed are from Philadelphia; the brass locks on the windows were made at Hartford, Conn.; the car wheels at Ramapo, New York; the ties were imported from Oregon. The list of other American articles one may see upon the docks at Guaqui and in the stores at La Paz are of equal interest. Breakfast foods from Battle Creek, Mich.; condensed milk and cream from the Middle West; tinned meats of every variety from Chicago; shoes, collars, underwear, etc., from New England. These are only a few among many and are a sufficient indication of the hold we are acquiring upon Bolivia's trade, notwithstanding the more general opinion that here, as elsewhere, our trade is languishing, an opinion too widely credited for Peru and Bolivia by virtue of its emphatic repetition. Our share in that trade is still too small, painfully small, but the significant fact is that it is growing. Another decade will see it well established there.

The next great railway improvement affecting the Bolivia Railway Co., through its facilitation of the rapidly growing imports over the Mollendo line, will be the all-rail route around Lake Titicaca. There are now two expensive trans-shipments, unthinkably difficult impediments when conditioned by a lake but 143 miles long. Not only will the commercial needs of the territory the railway serves demand this improvement; it will be strictly enforced upon the company by the competition afforded by the early completion of the shorter, all-land route from La Paz to the better harbor at Arica.

Conclusion

The general bearing of this brief study may be summarized as follows: Nearly 90 per cent. of the people and 100 per cent. of the railways are in the southwestern third of the Republic. The shortest land connection between the largest groups of people and a commercial highway is to the Pacific. In a land where labor is so extremely scarce as in Bolivia, and where tropical conditions in its lowlands will prevent dense populations for centuries, the essentials of a trade route are strategic, plateau locations and short routes to the sea coast. Once the coast is gained the principal point is won, for while it might at first sight seem much more advantageous to have down-valley connections with the Atlantic rather than trans-montane connection with the Pacific, the long water route around the Straits of Magellan in large steamers is, in fact, much better than a long and difficult eastern land haul by pack train and canoe and launch at ruinous rates, except on railways; and but little better if the railway is only an auxiliary to the launches and steamers upon the navigable streams. With the Panama Canal completed, Bolivia's ores, rubber, chocolate, wool, etc., will find an even cheaper and a very direct water route to this country, now rapidly increasing her share in the supply of Bolivian merchandise.* The superior silver ores and rubber pay export duty. The other articles in the list are exported duty free, unless exported in ingots, bars or in the form of coin.

The superior carrying capacity of the Pacific steamboat over batelon and canoe and the superior healthfulness of the sea route will for a long time outweigh the possibilities of traffic via the Amazon for the people of the plateau and even a portion of the adjacent plains of Bolivia. The service of the railway extensions to the plains has already been outlined, the essential fact being that the service is chiefly for the ultimate products of the plains dwellers

*According to the figures published in the *Bull.* of the Int. Bureau of Am. Repub. for July, 1908 and 1909 (pp. 69 and 37 respectively), the total foreign trade of Bolivia in 1906 was $45,347,000; in 1908, $33,837,000. The United States furnished 6.4 per cent. of Bolivia's imports for 1907, as against 5.6 per cent. in 1906 and 14 per cent. in 1908, Germany leading with 16 per cent. We took 0.32 per cent. of her exports in 1906 as against 0.13 per cent. in 1905. The exports by articles for 1907 are as follows:

Tin	$18,000,000
Rubber	5,300,000
Silver bullion and ore	2,375,000
Copper	1,650,000
Bismuth	575,000
Gold	18,000
Sundries, antimony, lead, etc	250,000

and for the equalization of the needs of the plateau groups and the plains groups of peoples. Railways would accomplish miraculous changes upon these plains and would serve to encourage the growing of products which depend absolutely upon rail transportation, but for neither the present products nor the population are such

FIG. 18.

An old road at Sacaba near Cochabamba, Bolivia. The road has been used for centuries and with constant wear has been sunk four or five feet below its original level. The trees and original mud walls are perched high up at the old level.

railways indispensable. The rubber and the chocolate alone, gathered from a thousand scattered sources, do not require, in fact could not themselves support, any safer or speedier facilities than improved launches and wagon roads and short connecting railways

would afford. And they are, by all odds, the chief source of extra-territorial shipments. The goods for the numerous highland towns and peoples on the other hand require swifter shipments, have greater bulk, more concentrated sources of tonnage, and the heaviest shipments are the exports, the down-grade consignments of mineral products to the Pacific Coast. Furthermore, the navigable waterways of Bolivia* already serve much of the plains region, and, in general, serve it fairly well, except at locations similar to those of the Madeira rapids. The plateau and mountain section, in which Bolivia's mineral wealth lies, and where, on account of favorable climate and nearness to mineral resources and the sea, her densest population will long reside, has practically no navigable waters (Lake Titicaca and a portion of the Desaguadero only) and these are interior basin waters, they do not reach the sea. In the one case railways are an improvement, in the other a necessity.

A number of convergent factors operate to-day to hold trade to the old routes to the Pacific. The directive momentum of the railways, themselves an absolute essential in the mineral development of the plateau near the Pacific, are a powerful cause. Ores could never have been handled over the rivers of a tropical jungle. The dangers of travel through a steaming lowland can only become of lesser importance when the exact nature of these dangers is definitely ascertained and tropical diseases prove more generally curable than they are to-day. Furthermore, the population of South America is notably absent from the hot lowlands of Amazonia. Laborers in sufficient quantity for the transport of goods on the navigable rivers of the Amazon basin are conspicuously absent. That defect is, in fact, fundamental to any scheme for the development of Amazonia. There are tributaries of the Negro in northern Brazil, in whose basins rubber trees have been discovered in abundance, but whose resources can not be developed because of the almost absolutely unpopulated conditions of large portions of these basins. Church† was right when he ridiculed the Pacific route for goods destined for Cochabamba and Sucre and Santa Cruz from the single standpoint of mere cost to the merchant and the consumer; but it is not the viewpoint of the merchants in these places, but rather that of the carrier, that must be considered. Lacking carriers on the plains, merchants can only secure carriers

* Bolivia's navigable waters total about 12,000 miles, and are almost wholly in the plains section; her wagon roads about 2,000 miles, between the largest towns; railways now actually in operation, over 400 miles.

† The Route to Bolivia via the River Amazon; G. E. Church, 1877, p. 150 et al.

from the plateau; and the plateau dweller, accustomed to aridity, and a healthful climate, has in all the history of South America and Mexico, dreaded the lowlands as he dreads the plague.* These factors are the most intangible and at the same time most potent of all and, therefore, the hardest to estimate. They have been totally overlooked by many writers who are concerned merely with distances and theoretic costs or costs based upon slight movement of goods in a region where, on account of a thin population, any increase of traffic would mean not only a doubling, but a trebling of existing rates. Were the eastern waterways of Bolivia opened to-morrow where would come the labor for operating canoes and batelons? Every student of the region knows how persistently the excuse "Es falta canoas" would be heard to-morrow as to-day, and how much more if traffic sought this route in any considerable quantity. Steam launches would improve conditions, and operating in conjunction with the railway now building about the falls of the Madeira might revolutionize traffic conditions. The difficulties of disease would still be present, however, and to this we must add the great expense for initial construction and upkeep of roads through the precipitous and rainy eastern Andes from the head of navigation to the plateau cities of Cochamba and La Paz. Most of the roads to the western seacoast are *per contra* notoriously good as to road-bed and grade. Comparatively little dissection marks the latter region; the former region possesses some of the profoundest descents and difficult trails it is possible to find.

As contrasted with the Atlantic route, the route west to the Pacific seaboard was in pre-railway days at a certain disadvantage. The Atlantic route had canoe service that was cheaper than the cart service of the western desert mountains and plains. The proximity of the Pacific and the healthfulness of the desert route undoubtedly held traffic to the more arduous way. No one can over-estimate the heat and disease of a flat tropical lowland as factors in keeping traffic to a more difficult and expensive, but less dangerous route. Costa Rica's experiences in this regard are instructive. Early in the 19th century the short, inexpensive, directer way from the relatively dry and more densely inhabited western section (in the lee of the mountains which here intercept the rain-bearing northeast trades) across the central mountains and the tropical lowlands of the east to the Atlantic seaboard was wholly

* Hans Gadow, Through Southern Mexico, and numerous other references relating to the Inca civilization, and the present trade routes of Tropical America, the plateau dwellers of Peru, Bolivia, and Mexico, etc.

untried and goods were then almost entirely forced to reach European markets by a voyage around Cape Horn! For a time the Saxapiqui route to the Atlantic was opened for tobacco shipments and European mail, but with the opening of the Panama Railway in 1855, the route "returned to its virgin solitude."*

These facts point to the conclusion that, in spite of the fact that 90 per cent. of Bolivia drains to the Atlantic and 10 per cent. is interior basin drainage with no outlet whatever to the Pacific, the section of the country in which the population is found yet looks toward the Pacific; and chiefly in this direction will she continue for many years to have relations with her commercial friends. Geographic position, the distribution of resources and climate are here equally powerful factors with topography and drainage, and, strange as it may seem, not only make, but will long continue to make the Atlantic slope, not the Pacific slope, the back door to Bolivia.

*Costa Rica; G. E. Church. *Geog. Journ.*, vol. 10, 1897. pp. 56-84.

THE ALPS DURING THE GLACIAL PERIOD*

BY

PROF. JAMES GEIKIE†

Among the most conspicuous evidences of formerly widespread ice-action in the Alpine Lands are the large travelled blocks or *erratics,* so lavishly scattered everywhere. From an early period these attracted the attention of intelligent travellers, some of whom expressed surprise when they saw that the isolated blocks did not consist of the same kind of rock as that of the mountains on which they rested. The numerous gigantic erratics—some as big as cottages—that strew the flanks of the Jura, looking towards the Alps, are often referred to as specially remarkable. Obviously these had been carried to where they are now found—but by what mysterious agency? Some—probably all—had come from the Alps,

* Die Alpen im Eiszeitalter. Von Albrecht Penck, Professor an der Univ. Berlin, u Eduard Brückner, Professor an d. Univ. Wien. In drei Bänden. Pp. 1199. Leipzig: Tauchnitz, 1909. Price 55 marks.

† This distinguished Scottish geologist wrote the review here printed of Penck and Brückner's great work upon the glaciation of the Alps. The paper appeared in the *Scottish Geographical Magazine*, pp. 481–91, 1909, and is reproduced in the *Bulletin* by its courtesy.

and had therefore travelled many miles. Amongst other vague conjectures it had been suggested that the transporting agent may have been water—that the blocks might have been swept down from the Alps by powerful débâcles or cataclysms. Such views, however, were considered unsatisfactory—a more reasonable explanation of the phenomenon had yet to be found. It is interesting to Scotsmen to know that the first to discover the solution of the problem—to divine the true origin of the erratics—was a fellow-countryman, John Playfair, formerly Professor of Natural Philosophy in the University of Edinburgh, and a devoted disciple of James Hutton, one of the greatest founders of the present system of Geology. During a visit to Switzerland in 1815, Playfair was much impressed with the great wandered blocks of the Jura. One of these—a mass of granite—he estimated to weight 2520 tons, and his sagacious reflections are worth quoting, inasmuch as his recognition of the glacial origin of the erratics of the Jura was in point of fact the first step taken to work out the history of the Ice Age. "When we consider," he remarks, "that the present point where the granite is to be found in its native place is at a distance of 70 miles, it will appear no easy matter to assign a conveyance by which this block could have performed such a journey over hills and valleys without considerable injury. A current of water, however powerful, could never have carried it up an acclivity, but would have deposited it in the first valley it came to, and would in a much less distance have rounded its angles, and given to it the shape so characteristic of stones subjected to the action of water. A glacier which fills up valleys in its course, and which conveys the rocks on its surface free from attrition, is the only agent we now see capable of transporting them to such a distance, without destroying that sharpness of the angles so distinctive of these masses."

Some fifteen years, however, were to elapse before the study of the glacial formations of the Alps began to be seriously attacked by scientific men. It is to Venetz, Charpentier, and L. Agassiz that we owe the first clear outline of the several phenomena which unite to prove beyond any question that the Alpine glaciers were formerly much more extensive. These early observers indeed may be truly said to have laid the foundations of glacial geology. During the many years that have passed since the results of their investigations were given to the world, hosts of geologists from every country have visited the Alpine lands and increased our knowledge of their

glaciation. But the next most notable advance was made when Morlot in 1854 and Heer in 1858 discovered that there had been more than one great extension of the glaciers. To these two investigators belongs the honor of having been the earliest to recognize the existence of certain accumulations which have come to be known as "interglacial" formations. Still later it was reserved for a Scotsman—Andrew Crombie Ramsay—to demonstrate that the great Alpine lakes occupy basins of glacial erosion. His views were for many years pertinaciously contested, but many of his opponents, who thought that he had greatly exaggerated glacial erosion, are to-day compelled to admit that glaciers are much more effective agents of erosion than Ramsay himself had suspected. In short, it is now maintained that the larger valleys of the Alps have been throughout widened and greatly deepened by glacial action, and that the present rock-basins, profound and capacious as they may be, are yet of subordinate importance—being relatively shallow depressions hollowed out in the bottoms of valleys already over-deepened by glacial scour and excavation.

Many other questions connected with the glacial history of the Alpine Lands have interested geologists since the appearance of Ramsay's paper, "On the glacial origin of certain lakes in Switzerland," but important as these are, it must be admitted that by the work of the earlier observers the fundamental conclusions of glacial geology had already been established. Shortly stated, these conclusions are as follows: (*a*) the former greater extension of the glaciers; (*b*) the periodical return of such extensive glaciation; and (*c*) the effective action of glacier-ice as a modifier of the earth's surface. Nearly thirty years ago Dr. Penck, in his well-known work on the glaciation of the German Alps, recognized that these conclusions summed up the chief results of glacial research hitherto obtained, and in his and Professor Brückner's recent great work —*Die Alpen in Eiszeitalter*—the same opinion is expressed with regard to the present position of glacial geology. It is needless to say, however, that the problems considered by the earlier observers have since their time been looked at from other points of view, and treated in a different manner, while many subsidiary problems of much interest and importance have been discussed. Only those who are conversant with the literature of the science can realize the great advances made within the past thirty or forty years. By the following of new lines of research and the employment of improved methods of investigation, our knowledge of the history

of the Ice Age of Europe has been in a manner revolutionized. And no researches of the kind have been more fruitful in results than those pursued in the Alpine Lands.

In the elaborate work by Penck and Brückner we have a complete and detailed summary of all that is at present known of the glacial phenomena of the Alps. They have themselves devoted many years to the study, during which they have explored, one may say, the entire chain from end to end. From time to time each has given some account of his labors and the views he has been led to hold as to the glacial history of the regions examined by him. In the masterly work before us these independent researches are combined, so as to form the most important contribution to glacial geology which has appeared for many years. It represents the labors of nearly a quarter of a century, carried on only during academic vacations, and largely if not entirely at the authors' own expense. This speaks volumes for the enthusiasm of these distinguished glacialists, and for their personal vigor—only men who are strong both mentally and bodily could have accomplished what they have done. The publication of their work has been spread over several years—the first part appearing in 1901, and the last at the close of 1908. The first volume is by Dr. Penck, and discusses the glacial phenomena of the northern "East Alps." In this volume the author summarizes the results obtained by his colleague in the Salzach district. The glaciation of the northern "West Alps" is discussed in the second volume, to which both authors contribute, while the third volume is devoted to the "South Alps" and the eastern slopes of the great chain, which are drained by the Mur, the Drave, and the Save, and is in like manner the work partly of Penck and partly of Brückner. The authors cover so wide an area and treat their subject in such detail that it is quite impossible in a magazine article to deal with their accounts of particular districts. We may, therefore, confine ourselves to a short and necessarily imperfect summary of some of the chief results obtained. These are set forth more or less fully by Professor Penck in the concluding chapters of Vol. III.

The Alpine glaciers of the Ice Age attained gigantic proportions as compared with their puny successors of to-day, but it must not be supposed that the mountain-land was ever so continuously covered with ice as is the case with Greenland. The ancient glaciers did not, like the vast Arctic glaciers, draw their supplies from one uninterrupted snowfield—each was fed from its own particular

névé-basin. Nevertheless neighboring glaciers were in many cases not so independent, so sharply separated from each other as in our day. Not infrequently they coalesced across what are now dividing watersheds. This was especially the case on the northern slopes of the chain, as in Switzerland, North Tyrol, and Upper Bavaria. In those regions the glaciers reached the low forelands, where they united to form a continuous ice-sheet. It was otherwise, however, with the glaciers that descended from the higher Alps towards the east and southwest. These were clearly separated from each other, and did not coalesce even upon the low grounds—indeed, many dropped their terminal moraines well within their mountain-valleys. The same to some extent was the case with the ice-flows that drained the southern flanks of the chain. Several of these, however, deployed upon the forelands—the glaciers that occupied the sites of the great lakes, Maggiore, Lugano, and Como, uniting outside of the mountain-valleys to form a continuous ice-covering. It would appear, therefore, that the middle section of the Alps, between Switzerland and Upper Bavaria on the one hand, and the region of the Italian lakes on the other, was the area of maximum glaciation. The elevated central part of that area was covered with continuous ice from which glaciers flowed north while others trended south. It is worthy of note, however, that the ice-shed separating those two sets of streams nowhere coincided with but lay north of the watershed. The same fact has been observed in connection with the glaciation of the Scandinavian Peninsula and the Scottish Highlands—in neither of those regions did the ice-shed of glacial times coincide with the watershed.

In general terms it may be said that the glaciers of the Ice Age were simply exaggerations of their present successors. The latter are fed from the same névé-basins as those from which the glaciers of the Ice Age drew their supplies. It would appear, moreover, that these basins were not as a rule more deeply filled in the Ice Age than they are now. The Alps above the existing snow-line, therefore, must have much the same appearance as in glacial times. If this be the case, then it would seem that the former vast development of glaciation was due not so much to increased precipitation of snow, as to a lower rate of ablation or melting. In other words, extreme glacial conditions were the immediate result of a general lowering of the temperature. It is further notable that the precipitation of glacial times bore a close relation to that of the present. The areas of maximum and minimum precipitation during the Ice

Age and in our own day are the same—the existing snow-line running approximately parallel to that of the glacial period, but at an average elevation of 1200 meters above it.

The general facies of the organic remains, met with here and there in the moraines and fluvio-glacial gravels of the period, are quite in keeping with these conditions. On the north side of the Alps the great confluent glaciers terminated in a dreary Tundra-like region, lying some 400 to 600 meters below the depressed snow-line. From the ice-front escaped numerous glacial streams which distributed broad sheets of shingle and gravel over the low forelands. During the short summer these gravel-flats would be traversed by a network of watercourses which in winter time would be mostly dried up. The foreland of the Alps would thus seem to have resembled the tracts extending outwards from the Vatnajökull in Iceland—a desolate region, yet sufficiently clothed with vegetation to tempt thither the mammoth, the woolly rhinoceros, and the reindeer. The conditions on the south side of the Alps were less forbidding. There the snow-line was higher, and forests extended up to a height of 800 to 1000 meters, so that many of the glaciers must have invaded the tree-covered areas, and it is even quite likely that trees may here and there have grown upon the moraine-covered glaciers themselves, just as is the case to-day in Alaska and the Himalaya.

The gravel-flats spreading out in front of the southern ice-flows were not so sterile as those on the opposite side of the mountains. In certain places, not liable to be flooded by the glacial waters, a somewhat rich molluscan fauna flourished. Forests, however, did not extend everywhere along the foot of the mountains—on the contrary, wide stretches of marsh and peat-bog covered considerable tracts, the pools in which nourished alpine diatoms. The great mammals that roamed the Tundras on the north side of the chain would seem not to have frequented the forest-lands of the south. The teeth of mammoth, which are not uncommon fossils in the northern gravel-beds, occur very rarely in the south—one specimen alone having been obtained—while remains of the reindeer have been met with only at Mentone on the west and in Carinthia on the east side of the Alps. Of the woolly rhinoceros no trace has occurred. It is further notable that the Arctic element, so conspicuous in the glacial fauna of the north, is not present in the south, where the fauna is characteristically alpine—chamois, ibex, alpine hare, and marmot having ranged far south in the peninsula. The

southern foreland of the Alps, therefore, must have resembled the south coast-lands of Alaska rather than the drearier wastes of Iceland. Towards the east and southwest extremities of the chain the larger glaciers must likewise have descended into forest-clad land. Many of the smaller ice-flows of those regions, however, were confined to the upper reaches of the mountain-valleys. The general aspect of middle Scandinavia probably reproduces not inaptly the conditions that characterized the two ends of the Alpine chain during glacial times—the summits of the Southwest Alps appearing then not unlike the present snowy heights in the interior of New Zealand.

The glacial and interglacial deposits of the Alpine Lands are wholly of Pleistocene or Quaternary age. Nowhere throughout the whole region have any passage-beds been discovered which might serve to link on the Pleistocene to the preceding Pleistocene period. Should such passage-beds exist they must lie buried under the enormously thick alluvial accumulations that cumber the valley of the Po.

During the Pleistocene or Quaternary period the Alps witnessed several remarkable climatic changes—epochs of extensive glaciation alternating with epochs of milder and even genial conditions, during which the glaciers retired to the inner recesses of the mountains. That such oscillations occurred has of course long been recognized, not only for the Alps, but for all the glaciated regions of Europe and North America. It is true that the evidence of those changes has now and again been called in question and attempts made to explain it away. For example, the occurrence of fossiliferous freshwater deposits interstratified with moraine accumulations, within the peripheral areas of the glaciated tracts of Northern Europe, has been accounted for by temporary advances and retreats of one and the same great *mer de glace*. And similar explanations have been given of the appearance of fossiliferous beds intercalated in the glacial deposits of North America. There are many phenomena, however, connected with those interglacial beds which the theory referred to does not and cannot account for. If the organic remains were always of such a character as to lead to the belief that the plants and animals they represent might have flourished in the immediate proximity of a great ice-sheet, there would be something to say for the theory in question. But so far is this from being the case that many interglacial deposits have yielded the remains of a fauna and flora strongly indicative of more genial

climatic conditions than now obtain in the same region. Not only so, but abundant evidence is forthcoming to show that interglacial epochs were of protracted duration;— in a word, the alternation of glacial and interglacial deposits points not to mere temporary advances and retreats of the glaciers but to secular climatic oscillations. The evidence adduced by MM. Penck and Brückner is so full and clear that it is impossible to misunderstand it. They recognize four distinct glacial epochs, separated the one from the other by more or less prolonged interglacial epochs. Each glacial stage is marked by a great series of moraines with their accompanying fluvio-glacial gravel-terraces. The interglacial stages, on the other hand, are distinguished by the presence of fossiliferous deposits, and by the evidence of long-continued and profound river erosion, of extensive sedimentation, and protracted atmospheric action. Not infrequently, when one series of moraines and moraine gravels has been superimposed directly upon another, the line of separation between the two series is nevertheless very marked—the older deposits having obviously been long exposed to "weathering," and even in many cases converted into hard rock-masses by the action of infiltrating water, before they were covered up by younger accumulations.

The several glacial epochs recognized by Penck and Brückner are named after localities where they are typically developed. Thus, beginning with the oldest, we have the Günz, the Mindel, the Riss, and the Würm epochs. During the first and last of these epochs the glaciation was less extensive than during the Mindel and the Riss epochs. It is remarkable that the Riss glaciers in certain valleys were larger than those which occupied the same valleys in the preceding Mindel epoch. In other valleys, however, the reverse was the case—the Mindel glaciers having attained a greater development than their successors in the Riss epoch. In the valleys of the Inn, the Salzach, and the Iller, for example, the Mindel glaciers were the greatest, but such was not the case with the Isar glacier, which was most extensive in the Riss epoch. So again in the Rhine region, in Switzerland, in the French Alps, and in the Po valley the Riss glaciation was the most extensive. It is thought that not unlikely these differences may have been the result of those differential crustal movements which are admitted to have affected the Alps during glacial times. If Switzerland experienced a movement of elevation in the interglacial epoch that followed the Mindel glaciation, the Riss glaciers in the West and Southwest

Alps would naturally attain larger dimensions than their predecessors of the earlier glacial epoch. Should subsequent research establish this conclusion, it would follow that the greatest depression of the snow-line must have taken place in the Mindel epoch—in other words, we should assign the maximum cold of the glacial period to the Mindel stage.

Although the phenomena of the great moraines and the fluvioglacial terraces of the Alpine forelands clearly shows that these tracts have experienced four successive glaciations, yet they do not tell us to what extent the glaciers retreated during the interglacial epochs. For such evidence we must turn to the fossiliferous interglacial deposits themselves, and they leave us in no doubt that the deglaciation was not less extensive than the glaciation. There were times when the glaciers retreated to the innermost recesses of the mountains, and the Alpine valleys experienced a warmer climate than the present. Among the most notable interglacial accumulations is the Höttinger Breccia, which occurs in the vicinity of Innsbrück. The rich flora obtained from this deposit has close affinities with a flora which flourishes to-day as far south as the southern coasts of the Black Sea. When the Pontic rhododendron and its associates flourished on the lofty mountain-slopes of the Inn Valley, the snow-line must have been some 400 meters at least higher than now. The climate, in short, could not have been less genial than that experienced at present upon the flanks of the Alps in Italy. There are certain contrasts between the interglacial floras of the northern and southern sides of the Alpine chain which are worth noting. The forests that clothed the mountain-slopes in the north were of the Baltic type, consisting mainly of conifers, oaks, maples, birches, and hazels. Along with these, however, were the yew, the box, the water-chestnut, etc., from the presence of which it may be inferred that the snow-line could not have been lower than it is to-day. On the south side of the Alps the flora had a marked Illyrian aspect: the chestnut flourished at a height of 800 meters, the vine grew, as it does to-day, along the banks of Lake Iseo, the box abounded, and the Pontic rhododendron (no longer an Alpine plant) was likewise very widely distributed. Nowhere was this interglacial flora associated with arctic-alpine types. The most notable animals of the time were extinct forms of elephant (not the mammoth) and rhinoceros (not the woolly species) and stag.

It would seem that the interglacial epochs were of unequal duration. This is indicated by the relative amount of geological work

accomplished during the several epochs. Thus it would appear that the genial interval that separated the Mindel and the Riss glaciations, greatly exceeded in duration the earliest interglacial epoch—that namely which came between the Günz and the Mindel glaciations. This conclusion is based on the fact that much more geological work was done during the Mindel-Riss than during the Günz-Mindel interglacial epoch. Unless, therefore, we are to assume that during the former epoch the agents of geological change acted with much more energy than in earlier interglacial times, which is highly improbable, we must conclude that the second interglacial stages was the most prolonged. On like grounds MM. Penck and Brückner believe that the third or Riss-Würm interglacial epoch was considerably shorter than the earliest or Günz-Mindel epoch.

For various reasons it is more difficult to determine the relative duration of the cold or glacial epochs. The extent of their respective moraines and fluvio-glacial gravels might lead one to infer that the Riss epoch was longer than the Würm epoch. But there are so many other considerations to be kept in view that such inferences cannot be advanced with much confidence.

The passing away of excessive glacial conditions in the Alps is indicated by a succession of large moraines and associated river-gravels, which seem to show that the final retreat of the last great glaciers was interrupted by at least three long pauses or "Rückzugsstadien." The moraines in question are separated from one another by what are termed "interstadial" deposits, which resemble in character and position true interglacial accumulations. Our authors are very guarded in their interpretation of these phenomena, but are clearly of opinion that the moraines indicate successive advances of the glaciers, each advance having been preceded by a retreat of unknown extent. Named from places at which they are typically displayed, the three series (beginning with the oldest) are known as the Bühlstadium, the Gschnitzstadium, and the Daunstadium. From many observations we learn that during the earliest of these stadia the average height attained by the snow-line was 900 meters below its present level, while in the subsequent stadia it rose successively—reaching in the Gschnitzstadium a height of 600 meters below the existing snow-line, and in the Daunstadium rising some 300 meters higher.

The interstadial stages imply long periods of time during which the glaciers retired up their valleys for considerable, if indeterminate, distances. So far, therefore, they are comparable to the inter-

glacial epochs. In like manner, the moraines of the Bühl, Gschnitz, and Daun stadia are comparable to the similar moraines of the preceding glacial epochs, since each series of moraines, old and young alike, indicates a distinct readvance of the glaciers. The authors fully recognize all this, and are even willing to admit that certain interstadial accumulations may eventually come to be recognized as of interglacial importance. In general, however, the evidence is not decisive—the "interstadial" deposits are wanting in any clear indications of interglacial conditions. Their plant-remains have not yet been exhaustively studied, and until this work has been done it is considered safer to look upon the deposits in question as indicating less important climatic changes than the true interglacial accumulations. It is to be hoped, therefore, that the plant-bearing beds will ere long receive the careful attention of competent botanists.

Until we are better informed as to the extent of the climatic oscillations in Post-Würm times it will be impossible to correlate the last chapters of Alpine glacial history with the contemporaneous records of the Ice Age in other parts of Europe. One can hardly doubt that the climatic changes which took place in Northwest Europe in late glacial and so-called "postglacial" times, are the counterparts of those that marked the closing phases of the Quaternary period in the Alps. And if this should be the case, as seems in the highest degree probable, it would be advisable to drop the use of the term *postglacial* altogether. The word ought to have a definite meaning, and yet it is applied in different countries to deposits which are not of the same age. Properly speaking, there are no "postglacial" formations in the Alps. The deposits so named belong to Post-Würm times, and contain the records of the closing stages of the Pleistocene or Quaternary period. The minor fluctuations—the successive advances and retreats of the Alpine glaciers, as indicated by the "Ruckzugsstadien" and the interstadial deposits—may well have been of as pronounced a character as the climatic oscillations that took place in Northwest Europe towards the end of Pleistocene times.

At present the absolute duration of the Ice Age cannot be determined in the absence of an exact chronological basis, such as might be supplied by Astronomy. All the geologist can attempt to do is to ascertain the relative duration of the several epochs of the period. The amount of geological work accomplished during those epochs varied considerably, as we have seen. If it be not unreasonable to infer that the greatest amount of work required the longest time for

its accomplishment, then it would appear that the Riss epoch must be three times further removed from the present than the Würm epoch, while the Mindel may be twelve times older than the latter—the Günz being perhaps one and a half times as old as the Mindel epoch. On various grounds the Würm glaciation is conjectured to have reached its maximum rather than over 20,000 years ago. If this estimate be taken as some indication of the duration of the two last interglacial epochs, then the Riss-Würm interglacial epoch must have lasted for 60,000 years or thereabout, and the preceding Mindel-Riss epoch for not less than 240,000 years. Although such estimates do not pretend to be more than rough approximations, they nevertheless help one to realize how greatly extended are the periods of time embraced by glacial history. If indeed we keep in view merely the enormous amount of denudation and sedimentation accomplished during glacial times, we shall be prepared to admit that the inception of the Ice Age may well date back for several hundred thousand years. The Quaternary deposits occupying the great valley of the Po have been derived from the tear and wear of the Alps, and attain a thickness so extraordinary that to supply all this material the rivers must have lowered their drainage areas by at least 100 meters. Those two rapid rivers, the Kandar and the Reuss, having succeeded in lowering their drainage area by one meter in 3000 to 4000 years, we can hardly assign a shorter period than 300,000 or 400,000 years for the denudation of the Southern Alps and the filling-up of the Po Valley by fluviatile action.

In glacial times an arctic-alpine fauna—including the mammoth, the woolly rhinoceros, and the reindeer—flourished on the north side of the Alps; subsequently it was replaced by an interglacial fauna, but after the latter had disappeared, the arctic-alpine forms returned. These faunas acquire a fresh interest when we learn that prehistoric man was associated with them. Human relics belonging to the Mousterian stage of culture occur along with the remains of the earliest arctic-alpine fauna, and bespeak the presence of man during the Riss glacial epoch. The same stage of culture persisted into the succeeding Riss-Würm epoch, when the arctic-alpine forms had retreated and an interglacial fauna had succeeded. How genial the conditions were at this stage is shown by the evidence derived from the recently discovered cave of Wildkirchli at a height of 1500 meters on the Ebenalp near Säntis. The mountains appear to have been clothed at that time with a thick vegetation, and the climate could

not have been less temperate, but was probably even more genial than the present. Mousterian man lived in caves high up on the mountain-slopes, where he followed the chase. The Riss-Würm interglacial epoch with its characteristic fauna passed away, to be succeeded by the Würm glacial epoch and the reappearance of the arctic-alpine fauna. The stage of culture had now advanced from the Mousterian to the Solutrian, and finally, in Post-Würm times, to the Magdalenian.

While the arctic-alpine fauna plays a most important rôle on the north side of the Alps, it is otherwise on the south side of the mountains. There a well-marked forest fauna flourished during both the Riss-Würm and the Mindel-Riss interglacial epochs. But in none of the southern interglacial beds have any traces of man yet been discovered. Should these eventually be met with we should expect to find the Mousterian types in the Riss-Würm, and the Chellean in the Mindel-Riss deposits.

An arctic-alpine fauna, as we have seen, is associated with the two younger glacial epochs, and a "warm" fauna with the two younger interglacial epochs. Whether the same was the case with the two older glacial epochs and the intervening Günz-Mindel interglacial epoch is not known. Fossils are of very rare occurrence in the older glacial accumulations, while deposits which can be with certainty assigned to the Günz-Mindel interglacial horizon have not yet been detected. All than can be asserted is that the latter epoch was of prolonged duration, but whether the climatic conditions were as genial as those of the later interglacial epochs we cannot tell. Not improbably the Günz glaciation may have witnessed the advent of the arctic-alpine fauna, while during the succeeding Günz-Mindel epoch the region may have been occupied by the characteristic interglacial fauna. Certain it is that the older and younger arctic-alpine faunas and the older and younger interglacial faunas which alternated with each other in the later stages of the period remained much the same throughout. Some notable changes, however, did occur. Thus the southern elephant (*E. meridionalis*) and the cave-bear, which played a conspicuous part in the earlier stages, either disappeared or were very sparingly present towards the close of the long cycle of climatic oscillations. And doubtless many modifications of the fauna may have taken place, of which no record has been preserved. Nevertheless when we reflect on the prolonged duration and the many pronounced climatic changes of the glacial period—inducing as the latter must have done great migrations—

we may well be surprised that the faunas seem to have undergone so little modification. It was not quite the same, as we have seen, with our own race—for during the period man passed through all the successive stages of culture, from the very primitive Chellean to the relatively advanced Magdalenian type.

There are many other topics discussed in the 1190 pages of MM. Penck's and Brückner's treatise which we should like to have indicated, but space forbids. We shall have written to little purpose, however, if some notion of the general scope of the work cannot be gathered from our imperfect sketch. That our authors' results will have a strong influence on glacial research in other lands cannot be doubted. We shall now probably be spared the frequently reiterated statement that glacier-ice is a most ineffective eroding agent. Probably also the reality of the recurrence of alternating glacial and genial epochs throughout the Ice Age will no longer be so confidently disputed.

The book is well illustrated with numerous geological sections, maps, and photographs, and with the aid of these the reader should have no difficulty in following the descriptions and discussions of the text. It might have been well, however, if our authors could have seen their way to prepare a general map (preferably colored) to show the distribution of the glacial and fluvio-glacial deposits of the several epochs and stadia.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

MEETING OF THE SOCIETY. A regular meeting of the Society was held at the Engineering Societies' Building, No. 29 West Thirty-ninth Street, on Tuesday Evening Feb. 15, 1910.

President Huntington in the chair.

The following persons, recommended by the Council, were elected to Fellowship:

Samuel P. Avery, Henry Goldman,
Miss Rosa M. Batchelor, Countess Spottiswood Mackin,
Robert Brundrett.

The occasion was marked by the conferring of the Charles P. Daly Medal upon Colonel Charles Chaillé-Long. In the presentation of the medal, President Huntington said that the special service to geography by Colonel Chaillé-Long, which the Society thus desired to commemorate, was summed up in the inscription on the medal, which he read as follows:

"Awarded in MCMIX to Charles Chaillé-Long in recognition of valuable

additions to geographical knowledge made by him in Africa. In 1874 he explored the unknown Nile north of Urondogani, discovered Lake Ibrahim and supplied the final evidence needed to prove that the river issuing from Victoria Nyanza is the Nile."

In his remarks on receiving the medal Colonel Chaillé-Long said in part:

"Mr. President: I am deeply touched by your flattering allusions to my share in the final solution of the Nile Source problem. As the only American to attach his name to the discovery of the Nile sources, it was the idea of *pro patria America* which inspired and stirred me to the achievement for which you have awarded me this great honor. I accept this medal with profound thanks and appreciation of the honor it confers. The pleasure I experience is saddened by the absence of one who was an affectionate and devoted friend and advocate, your lamented librarian, the late George C. Hurlbut.

"Mr. President, on this occasion it is fitting to make honorable mention of the American military mission to Egypt, of which I was a member, and which added prestige and honor to the American name in Egypt and Africa. The mission was semi-official, inspired by Gen. Sherman when General-in-Chief of the United States Army. It was composed of Federal and Confederate officers, ten of the former being officers actually in the United States Army detached on a year's leave of absence. Its purpose was partly scientific and it was employed by the progressive Ismail Khedive in scientific objects, among which was the final discovery of the Nile sources.

"It was an American who designated Tel-el-kebir as a defense against a threatened Turkish invasion; an American who made the preliminary hydrographic studies in 1870 which became the inspiration of the dam at Assouan a generation later; an American who, charged with the coast defenses of Egypt, constructed a counterpoise disappearing battery, which has since been adopted by the United States Government; an American who made a treaty with Uganda adding that country to Egypt, and navigating the unknown Victoria Nile, discovered lake Ibrahim, thus completing the work of Speke and Baker; an American who, having pushed the limits of Gordon's government south, extended it westward towards the Atlantic and eastward to the Indian Ocean to Kismayu and Mombasa. The latter port has since served as a point of penetration of the railroad from Mombasa to Uganda; an American who discovered the Wadi Raiyan, for which he holds the control. It would add another reservoir whose drainage capacity this year alone would have saved fifteen per cent. of the cotton crop. Used as a reservoir, it would double the summer supply of the Nile Beni-Zoef; Americans, finally, of the United States navy and marine corps, in 1882, saved thousands of lives, including those of the Khedive and family, and saved the city of Alexandria, the great seaport of Northeastern Africa, from entire destruction in 1882.

"Mr. President, I would add a tribute to my chief, the late General Charles Gordon, with whom I had the honor to serve as Chief of Staff, and who promptly recognized my share in the solution of geographical problems.

"Gordon was an officer of the Royal Engineers of the British Army. Had Gordon not been an Englishman he would have been an American. He has been misunderstood and misrepresented by his own countrymen. I had myself misunderstood some of his methods which seemed to me at the time illogical, but I gave to him during my service of three years, absolute devotion to the attainment of his object. I have never subscribed to the attribution to him of what Burton

called excessive "religiosity." I believed, on the contrary, that he was actuated rather by all the legitimate aspirations of a soldier; in a word, he was more soldier than saint.

Mr. President, I renew my thanks for and appreciation of the great honor this Society has conferred upon me, and to cite a line from Horace: "Alboque dies notanda lapillo"—this day is marked by me with a white stone.

President Huntington then introduced the speaker of the evening, Professor James H. Brewster of the University of Michigan, who addressed the Society on "From Bahia to Buenos Aires." Stereopticon views were shown.

The Society then adjourned.

NORTH AMERICA

SALES OF THE U. S. GEOLOGICAL SURVEY MAPS. Last year the Survey sold 475,636 topographic maps and 15,556 geologic folios. Formerly these folios were published only in folio form, but owing to the demand for a smaller size, the Survey has recently adopted an octavo or pocket form and will hereafter publish all folios in both forms. The octavo or book form will slip readily into a large coat pocket, and its price is 50 cents or double that of the folio, though in orders of $5. or more the price of the book is 30 cents.

GOVERNMENT IRRIGATION WORK IN THE WEST. In the *National Geographic Magazine* (Vol. 20, pp. 403-37, 1909), Mr. C. J. Blanchard, of the United States Reclamation Service, under the title, "The Call of the West," gives a graphic account of the work which has been and is being done by the Government in irrigating the arid West. Irrigation is, fundamentally, a climatic problem. Given sufficient rainfall, properly distributed throughout the year, and irrigation is unnecessary. Given a rainfall too small for purposes of agriculture, or a rainfall irregularly or unsatisfactorily distributed through the year, and irrigation becomes essential. Thus, all irrigation undertakings are inevitably of interest to climatologists. Mr. Blanchard makes an estimate, which he considers "conservative," that 30,000,000 acres of land will be reclaimed in the arid West. He gives an account of all the Government irrigation projects, with an abundance of illustrations showing the condition of the country before and after the water was supplied. There is also a useful sketch-map on which the location of the reclamation projects is shown. Up to January 1, 1909, the Reclamation Service has built more than 3,458 miles of canals and ditches, which, if placed end to end, would reach from New York to San Francisco. It has built 338 miles of roads, most of them in a country heretofore inaccessible. Nearly 1,000,000 acres are now ready for irrigation, embracing 4,686 farms. As a result of the activities of this Service, more than 20,000 people are now established in homes in the arid West.

R. DEC. WARD.

SOUTH AMERICA

DR. WILHELM SIEVERS' LATEST TRAVELS IN SOUTH AMERICA. The results of Dr. Sievers' studies of the geography of the northern cordillera of South America and of their former and present glaciation have long been before the public. Means were provided in Germany for the renewal of his work, last year. He reached Buenos Aires on March 20 and left the continent at Guayaquil on Oct. 29, having spent six months in extensive journeys among the mountains of Peru and Ecuador. He collected a large amount of new material, especially relating to

glacial phenomena, and considerable of it in virgin territory. Dr. Sievers has published an itinerary with a map of his routes in *Petermanns Mitteilungen* (Vol. 56, p. 24). The publication of his latest results will be awaited with interest.

STANDARD TIME FOR CHILE. Some two years ago, Peru adopted, as standard time, the 75th meridian west of Greenwich, which cuts the republic into nearly equal eastern and western parts. Chile has now followed Peru's example, though the 75th meridian lies to the west of the republic, excepting where it cuts the Peninsula of Taytao in the Province of Chiloé and some of the islands of the Magallanes Territory. This fact, however, will not interfere with the practical convenience of the new time standard, as Chile will have the same time as Peru and the eastern part of the United States, or in other words, five hours later than Greenwich time.

AFRICA

GOLD OUTPUT OF THE TRANSVAAL. The Transvaal colony made a new record in gold production, in the fiscal year, July, 1908-June, 1909. The tables given in the *Annual Report* of the Government Mining Engineer, for the year ending June 30, 1909, show that the total value of gold mined was $154,929,830. The Witwatersrand produced $149,484,130 of this amount. The Transvaal has thus again produced not only a far greater quantity of gold than any other country, but its output for the year was about 34 per cent. of the product of the world. The colony's coal industry is also growing, the output having been 3,312,413 short tons. The number of men employed in the Transvaal mining industries was 21,720 whites, 12,206 Chinese and 189,200 blacks.

FROM HAUSSA LAND TO EGYPT THROUGH THE SUDAN. Dr. Karl Kumm has made a preliminary report, with a map of his route, on his journey eastward throug the Sudan in 1908-9 (*Pet. Mitt.*, Vol. 56, p. 84, 1910). In the course of this journey he traversed three hitherto unexplored districts and visited about 70 towns and settlements not previously mapped. The first of these districts was in Northern Nigeria in the southern part of the Bautschi Mts., where he discovered several new mountain ranges; the second new region was in the French Shari territory on the lower course of the Bahr Salamaat and Bahr Auk; and the third was between Fort Archambault on the Shari river and Keffi Genji on the Bahr el Ghazal, a large territory embracing the regions Sinussi Ndele in Dar Kuti, Dar Banda and the watershed between the Nile-Congo and the Shari. Among his zoological discoveries were a new variety of the giraffe with three horns, the two in the rear being joined at the base, and a variety of the Buffalo with remarkably flat horns. He finally reached the Anglo-Egyptian province of the Bahr el Ghazal, with 200 half starved people, and arrived at Khartum on Dec. 3 last.

THROUGH UGANDA AND THE MOUNTAINS OF THE MOON. The lecture of Prof. Charles E. Fay, of Tufts College, before the Society on Dec. 21, with its accompaniment of superb lantern slides from the negatives of Vittorio Sella, afforded the opportunity to follow step by step the expedition of the Duke of the Abruzzi to the glacial sources of the Nile on the lofty summits of Ruwenzori in Equatorial Africa.

In his introduction, the lecturer gave a rapid sketch of this most versatile explorer, whose quests have been by sea and land, in the arctic ice and under the sun of the Equator, to the summit of Mt. Saint Elias, and, most recently, to the

highest point of our globe ascended by man, to 24,400 feet, on Bride Peak in the Himalaya of Cashmere.

Starting from the port of Mombasa, of which a few views were shown, the journey of some 560 miles to Victoria Nyanza,—from sea-level to an altitude, on the high plains of Athi of 8,500 feet, and then descending to 3,862 feet at Port Florence, was touched upon, a single snap-shot taken from the moving train showing the profusion of game that has rendered this region famous. A few striking views of the lake itself followed, with the canoes of the natives, and particularly a spirited view of Ripon Falls, at the point where the waters of this great inland sea débouche to form the Upper Nile.

Uganda was entered at Entebbe and several views presented the general appearance of the British capital and the homes of foreign residents, contrasted with those of the natives. The gathering of the little army of porters and other attendants (300 in number), small groups and individual types of these Baganda negroes, and their joyous departure under their loads of 50 lbs. each, strung out along the highway far as the eye could reach, opened the story and pictured scenes of the march across Uganda—the second stage of the journey of about 900 miles from the coast to the icy goal—the stage ending at Fort Portal, 220 miles from Entebbe, and lying at the base of the outliers of Ruwenzori, yet separated therefrom by the most difficult and toilsome part of the journey.

The road to Fort Portal, the seat of a Government Commissioner, is a well-kept highway over a country varied with hill and dale, with clearing, forest, and morass. Many views were shown illustrating the landscapes, and many representing the camps and camp-life of the Expedition. Of especial interest were those showing the wrestling, dancing and other entertainments furnished by the porters, and the home scenes of the inhabitants,—groups of women bringing supplies, chiefs and their attendants bearing gifts of welcome, etc.

The first sight of the Ruwenzori range, seen high above the clouds and covering an angle of many degrees, at a distance of nearly 50 miles, was of great interest, as bringing within the range of vision the phenomena of all the zones—a view of arctic conditions from the belt of the Equator. Interesting again from the fact that when the view was taken, it was a picture of the unknown, all its detail enigmatical; yet a few weeks later, at the farewell view of the Expedition, the mystery had vanished, the summits had all been ascended and named, and the whole hydrographic system of the upper streams of the Nile that drain into Lakes Albert and Albert Edward had been surveyed from those snowy points of vantage.

Beyond Fort Portal, came the increased interest of the more difficult way, with its steep, densely wooded hills, its streams to be forded, and the intricate jungle of strange shrubs and trees, growing out of swampy earth, in which, by reason of the absence of changes of wet and dry, the fallen trunks retained their solidity almost intact, while in the moist air, thick moss enlarged to dropsical proportions the limbs of the gigantic trees of the region. Fine pictures were presented of this unique flora; especially beautiful was a green-tinted picture of the *lobelia Stuhlmanni* in full blossom.

A permanent camp was reached at a chilly, rain-frequented locality called Bujongolo, 12,460 feet above the sea, on June 6. From this point the first ascent of a peak of Mt. Baker was made, the first of a series of uniformly successful climbs. This camp was in the Mobuka valley to the southeast of the range, on

a stream whose waters eventually reach Lake Albert Edward (south of the entire range), which in turn empties by the Semliki river into Lake Albert to the north of Ruwenzori. A low pass to the west of the camp led over into the valley west of Mt. Baker, in the direct watershed of the Semliki. From this (later called "Freshfield Pass"), the ascent was made to the highest summit of Mt. Baker, to which the name of "King Edward Peak" was given. From this summit Sella afterwards secured a fine panorama of the nearby snowy giants which were severally shown upon the screen. The nearly complete topography of the range is comprehended in this panorama.

Ruwenzori—once usually spoken of as a mountain—was found to be a great complex of mountain masses, lying along the water parting, not of the Nile and the Congo, but of those waters of the Nile that flow eastward and those flowing more directly to the Semliki and so to Lake Albert. To these massifs the Duke gave the names of the principal explorers of the sources of the Nile; Stanley, Baker, Speki, Gessi, Emin, and to the southernmost he applied the name of Thomson. At the urgent request of the Royal Geographical Society, he later consented that the name Luigi di Savoia should be substituted for Thomson. Upon each massif rise several individual summits, to which separate names have been given. Mt. Stanley has five of these, to the two highest of which the names of the dowager queen of Italy and the queen of England were given by the prince on the occasion of his first ascent. Margherita attains 16,815 feet; Alexandra, 16,749.

The lecturer read from the manuscript of the lecture given by Sella in Turin before an immense concourse including members of the royal family, the Duke's own account of this culminating success of his expedition, as he conveyed the news by a letter dispatched through a messenger to the members of the party at the more distant camp. Views taken during the ascent of the highest peaks were shown as the vivid narrative from the explorer's own lips proceeded, a story thrilling with the spirit of adventure and the most ardent patriotism.

Remaining five weeks in the region, the Duke personally ascended thirteen of the eighteen summits of the several massifs, omitting only three of the less difficult and rewarding. Careful measurements were made of the peaks, nine of which exceed the altitude of Mont Blanc, and the topography and hydrography were carefully studied and have since been mapped.

ASIA

MR. DOUGLAS CARRUTHERS' JOURNEY IN NORTH-WESTERN ARABIA. This naturalist made a journey, last year, in Arabia, starting from Jesi on the Hedjaz R. R., 22 miles east of the Dead Sea, travelling about 350 miles south-west, to the oasis of Teima and returning by routes partly east and partly west of his southern march. He describes his journey in the *Geographical Journal* (Vol. 35, pp. 225-45, with map).

He traversed a region that was practically unknown for most of the way and his narrative gives very interesting descriptions of the nomads and of the different phases of the country. His starting point, Jesi, is the limit of cultivation for all is desert to the east of it. He first visited the Belka, the headquarters of the Beni Sakhr, a Beduin people who derive their strength and wealth from this transition country where they have good pasturage for their large herds of camels and flocks of sheep and goats. They are the boldest of robbers and possess many

rifles but their sheikh proved a good friend. They were living in about 1,000 tents scattered along the wadis. True nomads, for they do not cultivate, they range over the country to the east, falling back, from time to time upon their base.

Carruthers went with them as they sought new pastures. The camel provides them with meat, milk, clothing, tents and transport. They spend their lives in stock-breeding and systematic robbery. Now and then, the Beduins will go on a foray to steal camels and so increase their herds. They want rifles, which means power and with stolen camels, they buy more rifles. They buy wives with camels which, in fact, are their only means of exchange. They think nothing of killing if anything is to be gained thereby. In Beduin warfare the camp itself is never molested and the men go off to fight knowing that their camps will not be pillaged.

After a few days' march, Carruthers and his small party left the Beni Sakhr. The limestone plateau soon merged into the black desert or "the desert of flints" as the nomads call it, almost level, sprinkled over with countless flints, with almost no animal life excepting a few birds and desert hares, without dew fall, 3,000 feet above sea level, cut up by many wadis that carry much water when sudden storms occur. Among the few birds was the ostrich, an interesting discovery, for no traveller except Palgrave has mentioned sighting them in Arabia. For six days, the camels had no water and very little to eat.

The most southern point reached was the oasis of Teima, the first town of importance in Northwestern Arabia. The oasis forms a large patch of vegetation in an absolutely sterile basin. The inhabitants were quite friendly but the governor, representing the Emir of Hail, ordered the explorer to leave and had his servants rob him of all his money. This ancient oasis has a wonderful water supply and its great well pit is famous all over Arabia. Ninety camels can draw water at the same time and the supply is carried to the extreme parts of the oasis by a system of irrigation canals. It is doubtless a strong spring of pure artesian water that the natives have chanced to tap. A great deal of water apparently flows across Arabia but it is deeply hidden in the sandstones. The oasis produces citrus and some other fruits and tobacco. Dates which grow to perfection, are the staple food. Much rock salt is collected. The people are of the purest Arab stock and very handsome. The oasis is growing and, with its great water supply, it should have enduring prosperity. The people are very suspicious of strangers, Turks as well as strangers.

Mr. Carruthers escaped to the north in the night and for some days skirted the western edge of the Nafud, a sand dune region whose west limits had not hitherto been defined. This region supports considerable vegetation and a tall grass called "knusi" is good camel feed. On the way north, he was captured by a raiding party of Beduins who would have stripped him of all his possessions if their chief had not been friendly with the Beni Sakhr tribe under whose protection he had set out. He found at the well called Bayer, on the line of the supposed ancient trade route between Egypt and Busra, the ruins of a large caravanserai in the midst of the sterile desert which indicates an ancient prosperity that has long since disappeared. The explorer says that the Beduin near the Hejaz railroad were opposed to the building of the line, chiefly because it would take away from them the blackmail they have always imposed upon pilgrim caravans in exchange for safe conduct through their territory.

POLAR

Success of Dr. Charcot's Antarctic Expedition. Dr. Jean Charcot, in command of the French Antarctic Expedition, arrived at Punta Arenas, Chile, on his exploring vessel *Pourqui Pas* on February 11. From this point he sent the following cablegram to France which has been communicated to the Society.

"I believe I have been able to carry out the scientific programme which had been arranged for my expedition by the Academy of Sciences. On our first voyage into the unknown, after reaching West Antarctica, we steamed to the, southwest, along the west coast of the mainland and continued the survey of the coast which we had begun in our former expedition. Grounding in shallow waters caused us considerable trouble but we completed the map as far as Adelaide Island, a remarkable bit of land about 81 miles in length. South of it we discovered a very large gulf, surveyed 120 miles of new coasts and finally reached Alexander I Land which was the chief goal of our enterprise. It was a most inhospitable region with an ice bound coast, great glaciers and icebergs and no shelter for our vessel.

"We therefore returned north and wintered at Petermann island. The winter temperature was comparatively moderate but the weather was extremely disagreeable and a number of our party were sick. Fortunately, all recovered. We made a number of interesting excursions and particularly on the glaciers.

"Our second campaign included studies in the South Shetland islands especially on Deception and Bridgman islands. Then we returned to the south, discovered new lands to the west and south of Alexander I Land, relocated Peter I island and sailed between the 69th and 71st parallels as far as 126° W. Long. We wished to accomplish more but we have done the best we could."

A little later information is that the party suffered to some extent from scurvy and the ship was damaged by collisions with icebergs. The motor sledges were impracticable on bad ice and the supply of food and coal was not adequate.

The Duke of Orleans' Arctic Cruise in 1909. Between June and September, last year, the Duke of Orleans made his third Arctic voyage on the *Belgica.* He was accompanied by the Antarctic explorer, Capt. de Gerlache, Dr. Récamier and the painter Ed. Mérite. His journey extended from the east coast of Greenland to Franz Josef Land. While hunting was the main object, an important oceanographic result was obtained. The *Belgica* reached the east coast of Greenland at Cape Hold With Hope (73° 30′ N.), then pushed further north, doubling Wollaston Foreland and took to the open sea, eastward, in about 78° N. The Duke improved the opportunity to complete the soundings of 1905 on Belgica Bank and he was able to fix the edge of the Greenland continental shelf in those waters. He found the edge of the shelf at 1,145 feet, that is to say, at a greater depth than usual. Such depths at the edge of the continental shelf seem especially to mark lands that have recently been subjected to great glaciation. The interesting fact was also noted that the edge of the polar current on the east Greenland coast seems to coincide with the edge of the continental shelf. Both going and coming, the expedition traced the edge of the pack ice between Spitsbergen and Franz Josef Land and ascertained the amount of its recession during the summer. (*Annales de Géog.*, Vol. 19, p. 95.)

Rasmussen's Proposed Expedition. The *Geographical Journal* prints a short paper (Vol. 35, pp. 295-9) by Knud Rasmussen on his coming expedition, the

official name of which will be "The Danish Ethnographical Expedition to the Central Eskimo." He believes it to be all but settled that the Greenland Eskimo at Smith Sound include a number of families who are the last immigrants from the American Eskimo districts and that they came from the north-western part of Baffin Land or, in other words, between Bylot island and Fury and Hecla Strait. The Eskimo living there are among the least known of their race though the district they occupy is probably the thoroughfare from the continent to Greenland. He proposes to study these Eskimo and also their little known congeners in the Barren Lands of northern Canada, the northern coasts of Hudson Bay and westward along the northern sea coast to Coronation Gulf. He expects to start from Copenhagen on his ship, a small vessel of the Göa type, in the summer of 1911, and to make his first winter quarters in Fury and Hecla Strait where he will make his studies and sledge trips around and in North-western Baffin Land. Quarters for the second winter will be sought in Chesterfield Inlet, convenient for work among the inland Eskimo and those of the western coast of Hudson Bay; the third winter quarters are likely to be established in Repulse Bay at the neck of Melville Penisula and it is hoped to travel westward along the coast as far as the huts of the almost unknown Eskimo of Coronation Gulf. Besides the small crew, a geologist and a physician will be included in the party and it is hoped to do considerable scientific work outside the study of the Central Eskimo.

METEOROLOGY

THE ANTICYCLONIC BELT OF THE NORTHERN HEMISPHERE. In the *Quarterly Journal* of the Royal Meteorological Society (Vol. XXXV, No. 152, 1909), there is a paper by Col. H. E. Rawson, C. B., on "The Anticyclonic Belt of the Northern Hemisphere." In a previous communication, a few years ago, the author brought forward some facts relating to the anticyclonic belt of the southern hemisphere, derived from an examination of the South African records from the year 1841 to 1906. He found that the cyclical oscillations of the belt to and from the equator over South Africa were strong enough to encourage the belief that an analysis of Australian records on the one side, and of Argentine records on the other, would prove that all the action-centers of the atmosphere were moving together over this wide area, and that a similar oscillation existed in the northern hemisphere. Col Rawson subsequently found that the investigations of Mr. H. C. Russell and Dr. W. J. S. Lockyer supported his conclusion that there is a period of about 9.5 years between the greatest south position of the anticyclonic belt in the southern hemisphere, the double oscillation thus taking 19 years. He has since extended his inquiry into the movement of the action-centers in the northern hemisphere, with a view to ascertaining whether they show any similar oscillation to and from the equator, which is not to be explained by seasonal changes of position. Dealing with the Nile floods, he draws the inference that the high-pressure systems which affect northeast Africa are farther north when the floods are in excess, and nearer to Egypt when they are deficient. He has also made an analysis of the tracks of hurricanes which passed north and south of the Manila Observatory, and finds that these throw an interesting light upon the oscillations of the action-centers of the atmosphere. R. DEC. WARD.

PHYSICAL GEOGRAPHY

GLACIATION IN SOUTHERN CALIFORNIA. The recent announcement of former glaciers in the San Bernardino Range, California, is of much interest (H. W.

Fairbanks and E. P Carey, *Science,* N. S. Vol. XXXI, 1910, 32-33). This brings mountain glaciers as far south as the latitude of Atlanta, Ga. and Charleston, S. C. where previously they had not been known in the United States south of the Sierra Nevada and the San Francisco peaks in Arizona. There seems to have been at least five glaciers, evidenced by cirques, lakes, terminal moraines, etc. None of these glaciers descended below 8,500 feet. They owed their existence to high altitude and north or northeast slopes. LAWRENCE MARTIN.

PLEISTOCENE GEOLOGY OF THE LEADVILLE QUADRANGLE. The detailed study of mountain glaciers and glaciation in the United States has resulted in another strong contribution published by the U. S. Geological Survey (Pleistocene Geology of the Leadville Quadrangle by S. R. Capps, Jr. *Bull.* 386, U. S. Geol. Survey, 1909, pp. 1-96) Parts of the Park and Sawatch Ranges of Colorado have been mapped, including the basins of thirty-seven valley glaciers whose total area was 358 square miles. These glaciers were from two to twenty miles in length. They headed at from 13,700 to 12,000 feet above sea level and descended to from 10,300 to 8,800 feet.

Evidences of glacial erosion include striae, cirques, truncated spurs, U-shaped valleys, hanging valleys, etc. Lateral, terminal, and ground moraines were deposited The author finds small remnants of what he interprets as older drift, with which he associates the high terraces of the Arkansas valley. There are also low terrace gravels. The glacial changes of drainage are of no little interest. Post-glacial erosion is trivial. LAWRENCE MARTIN.

VARIOUS

GEOGRAPHICAL BIBLIOGRAPHY. The 18th volume of "Bibliographie Géographique Annuelle," for 1908, issued as a part of *Annales de Géographie,* contains 1,105 notices of geographical books and papers that were published in 1908. The plan is selective rather than exhaustive but practically all the best works are included. The distinctive feature is the analytical and critical notes that accompany nearly all the references. They are admirably done by the many authoritative writers who collaborate with Dr. Louis Raveneau, under whose direction the bibliography is published. These notes not only give a clear idea of the scope of each book and paper but often condense the more important information it contains so that the volume is not only a good bibliography but also a valuable work of geographical reference. This feature has given to the annual a place of its own and the Paris publishing house of Armand Colin is to be congratulated upon the high estimation in which the book is held.

THE RETURN OF HALLEY'S COMET. This comet will cross the plane of the ecliptic on May 18 when it will be almost exactly between the sun and the earth, and the earth will probably be in the tail of the comet. Astronomers say that a fine display may be expected. The tail will probably be 20 or 30 degrees in length. The comet will best be seen at the end of May and a better view of it is anticipated in the United States than in more northern latitudes. Its history has been traced back to 240 B. C. and most of its returns have been recorded. It is believed that, in no case, can this comet return to perihelion unseen and therefore some of its reappearances were not recorded or the records perished.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

Trans-Himalaya. Discoveries and Adventures in Tibet. By Sven Hedin. 2 Vols. xxiii—436 pp. and xvii—439 pp., 388 Illustrations from Photographs, Water Color Sketches, and Drawings by the Author, 10 Maps and Index. The Macmillan Company, New York, 1909. $7.50.

The two volumes containing the account of Sven Hedin's last journey in Inner Asia deserve high praise and severe criticism. No one can read this account of a most daring journey in a fascinating land, without a feeling of genuine admiration for a man who had the pluck and determination to carry out so arduous an undertaking. Few travellers have ever displayed more skill in overcoming difficulties, and few have succeeded so well in winning the love and devotion of their followers. In all his journeys, Hedin's men have been faithful to him from first to last, a fact which speaks eloquently for the character of the brave Swedish explorer.

"Trans-Himalaya" is a book written for popular consumption. Starting from India, Hedin proposed to cross directly into Tibet. The British government, however, by reason of its recent agreement with China, felt obliged to forbid this. Therefore Hedin was forced to go northward from Ladakh into Chinese territory. There, in the dreary plateau of Karakorum, he swung to the east, and came into Tibet through the vast uninhabited wastes of the northwest. For seventy-nine days he and his faithful followers never once saw a human being other than their own companions. Day after day they marched over unending plains of gravel or snow at elevations of 16,000 or 17,000 feet, or over wearisome icy passes 19,000 feet above the sea. So great was the elevation that even in October the temperature fell to—17° and later it fell to—40°. Although a supply of grain was carried for the horses and mules, the poor beasts often had no forage. Little by little they grew weak and began to die, falling one by one at first, and later in twos or threes, to be devoured by rapacious wolves. Hedin describes his experiences vividly. The reader cannot fail to be impressed by his picturesque accounts of long toilsome marches when man and beast were half dead with cold, and of fierce storms which almost overwhelmed him when he put his folding boat on some of the many salt lakes of Tibet.

The purpose for which all these hardships were endured was the exploration of the large blank patch which has hitherto occupied the west central portion of maps of Tibet. Here Hedin crossed a great range of mountains, which was known at either end, but had never been explored for a space of 300 or 400 miles in the center. When, for the first time, he had crossed this Trans-Himalayan range, as he calls it, he came into the inhabited portion of Tibet. There, after many interesting experiences, he was turned back. The Tibetans firmly prevented his advance, but being mild people and not fond of violence, they yielded

to his incessant efforts, and permitted him to cross the Trans-Himalayas, once more, and then to come back again to Lake Manasarowar. There, near the sacred lake of the Hindus, he pushed his way to the sources of three great rivers, the Brahmaputra, the Sutlej, and the Indus, all rising close together. In the end, however, he was forced to leave Tibet and go back to Ladakh.

Most explorers would have been satisfied with what Hedin had accomplished, but having set himself a task, he pluckily kept at it. Without letting his men know what he planned, he equipped a new caravan in the extreme northeast of Ladakh, close to the limits of British authority. Then, in order to avoid all risk of being turned back by the authorities, he travelled far northward in midwinter along the baleful road over the Karakorum pass toward Khotan. When well beyond the danger of interference from any government, he turned eastward into the unknown plateau, and suddenly found himself face to face with the problem of how to feed his animals on nothing. His men, thinking that he was really going to Khotan, had disobeyed orders, and had not laid in the proper amount of grain. In spite of this Hedin kept on; and after sixty-four days without seeing human beings, his attenuated caravan arrived once more among the Tibetan nomads at the base of the Trans-Himalaya range. Here comes the most fascinating part of a highly interesting story—the tale of how Hedin assumed the disguise of a shepherd and for a while eluded the Tibetan officials. They soon grew suspicious, however, of a caravan which chose to travel in the worst of seasons on the worst of roads. When the disguise was thrown off, the explorer was once more forced to leave the country, but not until he had completed most of the exploration that he had planned. The chief result of Hedin's work is that he has proved that the Trans-Himalayas are a continuous range extending to almost as great a length as the Himalayas themselves. He has also mapped a considerable area of hitherto wholly unknown country. Future generations may not deem this so important a matter as Hedin would count it. Nor is it likely to be reckoned so great an achievement as his previous explorations in Chinese Turkestan. Nevertheless, as a piece of pioneer exploration, it is highly creditable and valuable.

Hedin's book, as we have indicated, is fascinating: in places it is positively thrilling: it is full of vivid descriptions of scenery and people; and it gives a clear idea of the aspect of one of the most unique parts of the world. Nevertheless, to the thoughtful reader, it is disappointing. As one reads on through the 900 pages of the two volumes a feeling of impatience comes over one. Why does not Hedin leave out some of the innumerable petty details about his horse, his puppy, his feelings, the man who happened to be his guide, the way his tent was pitched, and a score of other trivial matters? Instead of these, why not give us an occasional chapter, or at least a page or two of serious scientific descriptions? The quotation of a single paragraph will illustrate the way in which minor, and often personal details are continually repeated. On page 404 of volume I, we read:

"In Karu, wheat, barley, peas, and radishes are cultivated. We had made a short march, and I had ample time to interrogate the wise men of the village about the geography of the country, the means of communication, the climate, the habits of the river, and the directions of the wind; but I have no room for such particulars in this book. I would rather, instead, introduce our escort to the reader. [An escort, be it noted, that stayed with Hedin only a few days,

and has no importance to the reader unless it can be made to illustrate the habits and character of the people.] Vang Yi Tyn is a Dungan, born in Shigatse; Tso Tin Pang has a Chinese father and a Tibetan mother, has a home in Shigatse, holds the lamaistic faith, and murmurs prayers on the way; Lava Tashi and Shidar Pintso are pure Tibetans. All four are friendly and ready to help, and tell me in confidence that they mean to do their very best, that I may be pleased with them and give them good testimonials."

In other words, Hedin has unlimited space for anything personal, but almost no space for genuine science. Without detracting in the least from the readable quality of his book, he might have made it a permanent contribution to science, instead of an ephemeral story-book. On the physical side of geography he suggests various problems. For instance, he mentions the fact that the dissection of the Trans-Himalaya and Himalaya ranges is much greater on the south side than on the north, and attributes it to the heavy precipitation occasioned on the south by the monsoons. There is no suggestion of the alternative and more probable theory that the difference in the amount of dissection is due to the much steeper slope on the south. Again, frequent mention is made of wind-blown deposits of sand and loess along the sides of the great flood-plains of the plateau. Yet we find no hint of the fact that observations of this sort are of great interest to science; for geologists have surmised that the loess of the Danube and Mississippi valleys and of other portions of Europe and America may indicate that during the glacial period conditions of climate and river-flow in those regions were almost identical with those prevailing to-day in Tibet. Still another physical problem which Hedin neglects, is that of the numerous old lake strands which he notes again and again. In a few pages he might have summed up his observations, and given us some idea of how many such strands there are, their average elevation, the climatic conditions which they indicate, their relation to the glacial period and to similar strands in other parts of the world, and finally their relation to possible changes of climate in historic times. In regard to this latter point Hedin, in volume II, pp. 147, 154, et al., gives some account of the historic fluctuations of Lake Manasarowar, but fails to connect his statements with any great principle or problem which shall serve to give them significance to the reader.

Turning now to the field of human geography, the reader is beset by the same feeling of dissatisfaction as in the physical realm. On the northern border of the habitable portion of Tibet, or rather just beyond it, where the country is too high for agriculture or even for sheep-raising, he informs us that a considerable number of hunters wander about in summer. Wild yaks, wild asses, antelopes, sheep and other animals furnish them with a living. In the same region other nomads follow the mining profession, and eke out a poor existence by panning gold. In slightly lower regions, where grass begins to grow, the inhabitants are still nomads,—pastoral people who drive their sheep and yaks from place to place, and live in greasy little huts. Among them, bands of robbers are a frequent scourge. Still lower in the valleys of the great rivers, the Tibetans are able to rely upon agriculture for a living, and therefore live in permanent villages. A chapter devoted to each of these types of population would have made most interesting reading; and no one has the knowledge needed for such chapters more fully than Hedin. The dirtiness of the Tibetans, their architecture, methods of business, universal good temper, combined mildness and firmness, peculiar

monastic and matrimonial systems, and special form of government are all highly interesting matters to which reference is often made in the book; but the reader gets only the most fragmentary conception of them. They can be understood only through a comprehension of the effect of the physical character of Tibet upon the life of the people; and only the vaguest hint of any such relationship is to be found in the work.

In reading the account of Hedin's splendid courage and persistence, one's thoughts naturally turn to other explorers who have been noted for the same qualities. During the past century no one, perhaps, except Livingstone, has surpassed Hedin in these respects. Both must be highly honored for what they have accomplished in the face of tremendous difficulty. Yet there is a wide difference in the value and permanence of the results obtained. The difference is due apparently to the motive with which the explorations of each were undertaken. Three great motives have prompted travellers: First, the altruistic motive which kept Livingstone at his task till the bitter end, and caused him deliberately to set aside honor and his own ease for the sake of the oppressed natives of Africa. Second, the love of science. It was this which animated Darwin, and caused him to write the famous "Voyage of the Beagle." Finally we have the personal motive, pure love of adventure and the desire to be the first to explore new lands. Hedin's volumes are preeminently typical of this last motive. It is not the purpose of this review to compare the work of Hedin with that of other travellers, but any attempt to estimate the value and permanence of his work inevitably leads to a consideration of the effect which an explorer's purpose exerts upon his results. ELLSWORTH HUNTINGTON.

Landeskunde von Chile. Aus dem Nachlass von Dr. Med. Carl Martin, Puerto Montt (Chile). Für den Druck durch gesehen von Prof. Dr. P. Stange in Erfurt. Mit einem Lebensumriss und einem Portrait des Verfassers, 73 Abbildungen auf 36 Tafeler und einer Karte von Chile. Publikation des Geographischen Institutes der Universität Jena. Verlag von L. Friedrichsen & Co., Hamburg, 1909.

The author of this valuable book was one of those Germans, more numerous a generation ago than nowadays, who left their country in search of the unknown and on that search took root in a foreign soil, and there helped to develop their adopted country and to supply the rest of the world with contributions to its knowledge of their new homes. A physician by profession, Dr. Martin had nevertheless the true geographical instinct which, aided by his travels, enabled him to leave us, as the result of forty years spent in the trans-Andean republic, this monograph upon which a professional geographer could hardly have improved. Like most of us, Dr. Martin sees the greatest geographical problem of the country in its extraordinary extension through 40 degrees of latitude with a width in places no larger than the distance New York—Boston. Yet the unity of the nation does not seem jeopardized by it. With the exception of the northernmost provinces which have been under Chilean government for a short time only, and whose physiographic conditions, too, differ notably from the country south of the desert region, the population is entirely one, in spite of the admixture of foreign blood. There is an interesting resemblance between the 13 colonies before the American War of Independence, and Chile, in their being shut in between the ocean on one side and a mountain barrier on the other, and the

unifying effects of the location seem to be the same. On the other hand, Argentina resembles French Canada in its physiographic aspects and political expansion over the Hinterland, which results in a much lesser hold on the soil.

The great longitudinal valley is the heart of the country; its inhabitants are almost exclusively Chilean, the majority of the foreigners live in the seaports, but their number is insignificant in proportion to the whole population. The natives, although more numerous even than the foreigners, are of no account. Thus the bulk of the population is entirely Spanish. It descends from colonists from northern Spain, mixed with later immigrants from Northern and Western Europe, which gives it, in respect of the sturdiness and energy of the race, an enormous advantage over Argentina, whose founders came from southern Spain, and whose immigrants hail mostly from Italy and the south and east of Europe.

Socially the English-speaking foreigners are most conspicuous, while the Germans, similar to those of the Middle West in the United States, are mostly peasants who have cleared the forests and settled on their own farms. They form colonists of pioneers in the wilderness, especially in Llanquihue, and, a rare case in the New World, they have preserved their language in spite of their loyalty to the new country, while the English either intermarry with the Spaniards or return to the old country after having acquired a fortune. Other nationalities are not worth mentioning; those of southern Europe generally associate with the natives; those of northern Europe—including, curiously enough, the Czechs—associate with the Germans. In all, the combined number of foreigners is about 1 per cent. of the total population.

The country has free public schools and all kinds of higher institutions of learning. The separation of Church and State is a fundamental principle of the Constitution; yet the Roman Catholic Church is, to a certain degree, protected by the State. It is a continuous source of trouble in the extreme North where the priests are still appointed by the Peruvian bishop as in the old times, and thus keep Peruvian sympathies alive in the conquered provinces.

Valparaiso is the leading commercial city, not on account of its harbor, which is open to the dangerous north and northwest winds, but on account of its nearness to Santiago which, controlling the paths across the mountains, was an important center even in Inca times. The harbor of Aninteros near by is much safer, but as the capital for its development is at Valparaiso, the commercial and financial center, there is little probability that such a scheme will ever be seriously considered. The intellectual center, on the other hand, is Santiago, and Concepción is the railway center. Chile needs railroads to connect its widely distant provinces, and thus a large percentage of its lines, while they do not pay and probably never will, are run by the government as a means of unification for the country and nation. The backbone of the system is the line along the central valley from Valparaiso to Puerto Montt, where it connects with a steamboat line to Cape Horn. Numerous smaller steamboat companies keep up a lively traffic along the coast. But not before the completion of the trans-Andean Railroad and the Panama Canal will the national resources of the country be fully developed. The larger part of the 777 pages is given to a vivid description of these wonderful resources. Numerous illustrations, half tones and colored plates aid the text in describing the character of the landscape. A very fine map, two indexes, and an extensive bibliography bear testimony to the thoroughness with which the volume was prepared. It is a pity that the author did not live to see it finished.

MARTHA K. GENTHE.

The Palisades of the Hudson. Their Formation, Tradition, Romance, Historical Associations, Natural Wonders and Preservation. By Arthur C. Mack. 58 pp., Map and Illustrations. The Palisade Press, Edgewater, New Jersey. 75c.

An excellent little book which all who love the Palisades should read. The description of the formation is clearly expressed and will give an accurate idea to the general reader. The best feature of the book is its description of the rich historical associations of the Palisades. These details will open new sources of enjoyment to those who love to wander along this wonderful sentinal wall overlooking the Hudson.

Cyrus Hall McCormick. His Life and Work. By Herbert N. Casson. xii and 264 pp., Illustrations, and Index. A. C. McClurg & Co., Chicago, 1909.

American farmers were saying, when Cyrus H. McCormick was a farmer boy, that though wonders of invention were coming to pass, they did not think it possible that a machine would ever be made which would cut grass and grain. McCormick made his name a household word in many lands by evolving a practical machine which, as its inventor perfected it, completely filled the need of the vast multitude of grain growers. To this day, the making of reapers has remained an American business. This book tells, with sympathy and authority, the whole story of the life and work of the great inventor and of the evolution of the machine that made it possible for the United States to become the greatest wheat-growing nation.

The Eruption of Vesuvius in April, 1906. By H. J. Johnston-Lavis, M.D. 62 pp., 16 Photo-engraved Plates, 2 plans, 2 figures, and 2 colored maps. Reprinted from the *Sci. Trans.* of the Royal Dublin Society, Vol. 9, Part 8, Jan., 1909. Univ. Press, Dublin, 1909.

Over twenty years ago Dr. Johnston-Lavis published his Geological Map of Vesuvius. In the present work (a quarto) he calls attention to the severe paroxysms that shook the flanks of the mountain in the Nineteenth Century and especially those of 1872 and later, the outburst of 1872, which was the most important preceding that of April, 1906. These later eruptions added no less than five great, solid masses of lava to the volcano.

All but five introductory pages are given to a description and discussion of the phenomena of the remarkable eruptive period of 1906. The work forms the most complete scientific treatment of all phases of the great eruption of 1906 that has appeared in English. The dominant features of the eruption were the extensive truncation of the great cone and the large amount of fragmentary ejecta spread over the mountain and region around Vesuvius.

Dr. Johnston-Lavis says that if we go back over a century we may give many examples of as extensive outflows of lava, but the only parallel for paroxysmal energy and degradation of the cone is that of 1822. The *Bulletin* reproduces here one of the many photo-engravings in the book. It shows the aspect of the great cone of Vesuvius on May 4, 1906, as seen from the Punta del Nasone on Monte Somma looking due South. The view gives a good idea of the remarkable truncation of the cone. The dotted line shows the outline of Vesuvius in Oct., 1903, taken with the same camera and lens, and represents, except for a faint variation at the extreme summit, the actual outline of the cone before it was truncated by the last eruption.

TRUNCATION OF MT. VESUVIUS.

See p. 220.

CURRENT GEOGRAPHICAL PAPERS

NORTH AMERICA

BRIGHAM, PROF. ALBERT PERRY. The Development of Wheat Culture in North America. 17 pp. [Read at the Winnipeg Meeting of the British Association, Aug., 1909.]

United States

ABBOT, C. G. A Shelter for Observers on Mount Whitney. Ills. *Smithsonian Misc. Collec.*, Vol. 5, Part 4, Pub. No. 1872, pp. 499-506, Washington, 1910.

AUBURY, LEWIS E. Mineral Productions, County Maps and Mining Laws of California. *Bull.* No. 56, Cal. State Mining Bureau, 78 pp., and 21 Maps, San Francisco, 1909.

BROOKS, ALFRED H. The Distribution of Mineral Resources in Alaska. Map. *Bull.* 345, Report on Progress of Investigations in 1907, U. S. Geol. Surv., pp. 18-21, 1908.

BROOKS, ALFRED H. The Mining Industry in 1907. *Bull.* 345, Mineral Resources of Alaska, Report of Progress of Investigations in 1907, U. S. Geol. Surv., pp. 30-53, 1908.

BURCHARD, ERNEST F. AND CHARLES BUTTS. Iron Ores, Fuels, and Fluxes of the Birmingham District, Alabama. *Bull.* 400, U. S. Geol. Surv., 204 pp., Maps, and Ills., Washington, 1910.

CAPPS, STEPHEN R. Glaciation on the North Side of the Wrangell Mountains, Alaska. Map and Ills. *Jour. of Geol.*, Vol. 18, No. 1, pp. 33-57, 1909.

GANNETT, S. S., AND D. H. BALDWIN. Results of Spirit Leveling in Ohio, 1898 to 1908. [List of elevations based on mean sea level and determined by spirit leveling.] *Bull.* 411, U. S. Geol. Surv., Washington, 1909.

MADDREN, A. G. The Innoko Gold-Placer District, Alaska With Accounts of the Central Kuskokwim Valley and the Ruby Creek and Gold Hill Placers. 87 pp., Maps, and Index. *Bull.* 410, U. S. Geol. Surv., Washington, 1910.

MOOREHEAD, WARREN K. Fort Ancient. The Great Prehistoric Earthwork of Warren County, Ohio. Map and Ills. *Bull.* 4, Dept. of Archæology, Phillips Academy, pp. 29-166, Andover, Mass., 1908.

PEABODY, CHARLES. The Exploration of Bushey Cavern, near Cavetown, Maryland. Maps and Ills. *Bull.* 4, Dept. of Archæology, Phillips Academy, pp. 1-25, Andover, Mass., 1908.

RICHARDS, HARRY A. A Study of New England Mortality. *Amer. Stat. Assoc.*, Vol. 11, New Ser., No. 88, pp. 636-646, Boston, 1909.

SANFORD, SAMUEL. The Topography and Geology of Southern Florida. Ills. Second Annual *Report* for 1908-9, Florida State Geol. Surv., pp. 177-231, Tallahassee, 1909.

SELLARDS, E. H. Mineral Industries. [In Florida.] Map and Ills. Second Annual *Report*, 1908-9, Florida State Geol. Surv., pp. 235-251, Tallahassee, 1909.

TAVERNIER, RENÉ, AND MARSHALL O. LEIGHTON. The Public Utility of Water Powers and their Governmental Regulation. *Water-Supply Paper* 238, U. S. Geol. Surv., Washington, 1910.

—— Abstract of Annual Report Statistics of Cities, 1907. *Bull.* 105, Bureau of the Census, Washington, 1909.

—— Decisions of the United States Geographic Board, rendered Nov. 3 and Dec. 1, 1909.

—— General Geologic History. [Florida.] Second Annual *Report* for 1908-09. Florida State Geol. Surv., pp. 162-173, Tallahassee, 1909.

—— Stratigraphic Geology. Table and Ills. Second Annual *Report,* 1908-9, Florida State Geol. Surv., pp. 50-161, Tallahassee, 1909.

—— Soils. Second Annual *Report,* 1908-09, Florida State Geol. Surv., pp. 43-49, Tallahassee, 1909.

Canada

MACKINNON, W. A. The Canadian Fruit Industry. *United Empire,* Vol. 1 (New Ser.), No. 1, pp. 20-35, 1910.

Mexico

—— Mexico's New Mining Code. *Bull.* Internat. Bur. Amer. Reps., No. 1, pp. 108-111, 1910.

CENTRAL AND SOUTH AMERICA

Cuba

—— Boletin Oficial de la Secretaria de Agricultura, Comercio y Trabajo, Republica de Cuba. Vol. 7, No. 5, 514 pp., Maps, and Ills., Havana, 1909.

Guatemala

LOTTERMOSER, ECKARD. Die Ergebnisse der Temperatur-Beobachtungen in Salvador und Süd-Guatemala. *Mitt.* der Geog. Gesellschaft in Hamburg, Vol. 24, pp. 31-84, 1909.

—— Guatemala City. Latin American Municipalities. Ills. *Bull.* Intern. Bur. Amer. Reps., Feb., pp. 214-228, 1910.

Andes

—— The International Significance of the Andean Tunnel. Ills. and Profile. *Bull.* Intern. Bur. Amer. Reps., Feb., pp. 198-206, 1910.

Argentina

CRASTRE, FRANÇOIS. A travers l'Argentine moderne. Ills. *Le Tour du Monde,* Vol. 15, Nos. 45-49, 1909.

MORENO, NICOLÁS BESIO. La Pampasia Argentina ante la Geologiá moderna. Contribución al Estudio del Desecamiento progresivo del Globo. Separate, Universidad Nacional de la Plata, 4 Congreso Científico, pp. 75-102, Buenos Aires, 1909.

Brazil

KRONE, R. Beiträge zur Sambaqui-Frage. Ethnographische Mitteilungen aus dem Ribeira gebiet im Süden des Staates São Paulo. Maps. *Pet. Mitt.,* Vol. 55, No. 10, pp. 253-6, and No. 11, pp. 309-12, 1909.

—— A Trip to Paulo Affonso Falls in Brazil. *Bull.* Intern. Bureau of Amer. Reps., No. 1, pp. 66-81, 1910.

Chile

BERTRAND, A., AND LUIS RISO-PATRON. Rapport sur les traveaux géodésiques au Chili présenté à la 16me conférence générale de l'Association Géodesique Internationale, Londre, 1909. 8 pages, Maps and Ills.

PENROSE, R. A. F., JR. The Nitrate Deposits of Chile. Map and Ills. *Jour. of Geol.*, Vol. 18, No. 1, pp. 1-32, 1910.

Dutch Guiana

VERLOOP, J. H. Die Goldlagerstätten des Guyana Gold Placers. Map and Profiles. *Verhandlungen* der Naturforsch. Gesells. in Basel, Vol. 20, No. 2, pp. 217-251, 1909.

Peru

ADAMS, GEORGE I. An Outline Review of the Geology of Peru. Maps and Ills. *Annual Report* Smithson. Inst., pp. 385-430, 1908.

CHABERT, F. Le Pérou contemporain. *Bull.* Soc. Languedocienne de Géog., Vol. 32, Trim. 2, pp. 206-234, 1909.

Venezuela

—— Venezuela, the Land of the Llanos. Ills. *Bull.* Inter. Bur. Amer. Reps., No. 1, pp. 48-56, 1910.

AFRICA

East Africa

BIANCO, CAPT. ALFREDO. Relazione del viaggio da Assab al Dobi e vice-versa [Eritrea]. Map, Ills. *Boll.* della Soc. Geog. Ital., Vol. 10, No. 11, pp. 1225-59; No. 12, pp. 1411-14, 1909.

CHESNEAU, MARIUS. Résultats cartographiques de l'expédition du professeur Carl Uhlig dans l'Afrique orientale allemande. *La Géog.*, Vol. 20, No. 5, pp. 313-316, 1909.

HUTEREAU, A. Notes sur la vie familiale et juridique des Mayumbe. *Bull.* de la Soc. R. Belge de Géog., Vol. 33, Nos. 4 and 5, pp. 297-315 and 357-371, 1909.

MORI, ATTILIO. I Confini e l'Area dell' Africa Italiana. Map. *Rivista Geog. Ital.*, Nov., 1908, March, May, and July, 1909.

SINGELMANN, CARL. Aus dem Sambesi-Golddistrikt. Map. *Deutsche Kolonialzeit.*, Vol. 27, No. 2, p. 21, 1909.

North Africa

BERNARD, GEN. Le Haut Guir. Map. *Bull.* Soc. de Géog. d'Alger et de l'Afrique du Nord, Vol. 14, Trim. 2, pp. 204-222, 1909.

CHANTRE, MME B. Sur les routes de Tunisie. Ills. *Le Tour du Monde.* pp. 481, 493, 1908, and pp. 493, 505, 1909.

CHUDEAU, R. Taoudenni et Teghazza. Map. *Bull.* Comité de l'Afrique franç., Vol. 20, No. 1, pp. 13-16, 1910.

COLONNA DE LECA, CAPT. Voyage à travers le Sahara. Map. *Renseign. Col.*, pp. 169-79, 205-10, 232-46, and 278-82, 1909.

COUR, A. Quelques publications récentes sur les dialectes berbères. Bibliography. *Bull.* de la Soc. de Géog. d'Alger, Vol. 14, Trim. 3, pp. 395-399, 1909.

FROBENIUS, LEO. Kulturgeographische Betrachtung Nordwest-Afrikas. *Zeitsch.* der Gesells. für Erdkunde zu Berlin, No. 10, pp. 677-688, 1909.

MATHUISIEULX, H. MÉHIER DE. La Tripolitaine. *Bull.* de la Soc. de Géog. et d'Études Col. de Marseille, Vol. 32, Nos. 1 and 2, pp. 17-36, 1909.

VOINOT, L. Le Tidikelt. Map and Plates. *Bull. Trim.* de la Soc. de Géog. et d'Archéol. d'Oran, Vol. 29, June, Sept., and Dec., pp. 185-216, 311-366, and 419-480, Oran, 1909.

—— Les Possessions espagnoles dans le nord du Maroc. *Bull.* Union Géog. du nord de la France, Vol. 30, Trim. 3, pp. 161-165, 1909.

—— Les grandes caravanes du Sud Oranais (1908-1909). *Bull. Trim.* de la Soc. de Géog. et d'Archéol. d'Oran, Vol. 29, Dec., pp. 506-530, 1909.

—— Situation économique et commerciale du Maroc en 1907. *Bull.* de la Soc. de Géog. d'Alger, Vol. 14, 2me Trimestre, pp. 145-160, 1909.

West Africa

BAUDON, A. De Brazzaville à Franceville: Les savanes du Congo français. *Bull.* de la Soc. de Géog. et d'Études col. de Marseille, Vol. 32, No. 4, Trim. 4, 1908, pp. 303-343, 1909.

BERNARD, R. P. Au Soudan Français. Bamako. Le passé, le présent et l'avenir. Ills. *Les Missions cathol.*, Vol. 41, Nos. 2116 and 2117, pp. 620-622 and 631-633, 1909.

COTTES, A. La Guinée Espagnole. Map. *Annales* de Géog., Vol. 18, No. 102, pp. 433-450, 1909.

DUJOUR. De la moyenne Sangha au bas Ogooué. *La Géographie,* Vol. 20, No. 5, pp. 273-280, 1909.

MÜLLER, RUDOLF. Regenverteilung, Pflanzendecke und Besiedlung Ober-Guineas und des westlichen Sudan. Map and Ills. *Geog. Zeitsch.*, Vol. 15, Nos. 11 and 12, pp. 620-641 and 684-700, 1909.

PEYRISSAC, LÉON. Aux ruines des grandes cités soudanaises. *Bull.* Soc. de Géog. Commerc. de Bordeaux, Vol. 36, No. 1, pp. 8-14, 1910.

PRINS, PIERRE. Observations géographiques et physiques en pays Zandé. Banda, Wassa, Adja et Kreich. Map, Profile, and Plan. *Bull.* Soc. de Géog. Commerc. de Paris, Vol. 31, Nos. 9 and 10, pp. 569-99 and 617-44, 1909.

ROCHE, COMMANDANT J.-B. Au pays des Pahouins. Du Gabon au Cameroun. *Bull.* Soc. de Géog. et d'Études col. de Marseille, Vol. 32, No. 4, Trim. 4, 1908, pp. 344-355, 1909.

SCHERER, JOSEF. Liberiansche Küstenfahrten und Urwaldwanderungen. *Globus,* Vol. 96, No. 15, pp. 234-40, No. 16, pp. 245-251, 1909.

SCHIFFER, CAPT. La Côte d'Ivoire. Ills. *Bull.* Soc. de Géog. de Lille, Vol. 52, No. 12, pp. 321-342, 1909.

SONGY, L. La Question économique en Afrique Occidentale Française. Map and Ills. *A travers le Monde,* Vol. 16, No. 1, pp. 1-4, 1910.

VIALA, L. FERNAND. Exploration en Haute-Guinée. *Bull.* Soc. Languedocienne de Géog., Vol. 32, Trim. 1, pp. 25-68, Montpellier, 1909.

—— Le régime foncier du Congo belge. *Bull.* de la Soc. Belge d'Études Col., Vol. 16, No. 11, pp. 711-747, 1909.

—— Quelques Particularités sur l'Ethnographie et les Mœurs congolaises. *Bull.* de la Soc. de Géog. d'Alger., Vol. 14, Trim. 2, pp. 251-272, 1909.

ASIA

SILVESTRE, J. Notice sur les Monnaies circulantes dans les Pays d'Extrême-Orient. *Bull.* de la Soc. de Géog. de Rochefort, Vol. 31, Nos. 1 and 2, pp. 2-25 and 65-82, 1909.

Asiatic Russia

SCHOKALSKY, J. DE. Le niveau des lacs de l'Asie Centrale russe et les changements de climat. Map and Diagrams. *Annales de Géog.*, Vol. 18, No. 102, pp. 407-15, 1909.

—— Organization of Kamchatka. *Monthly Cons. and Trade Reports*, No. 351, p. 183, 1909.

Asiatic Turkey

BONIN, CHARLES-EUDES. Le chemin de fer du Hedjaz. *Annales de Géog.*, Vol. 18, No. 102, pp. 416-432, 1909.

MARCHAND, H. La Navigation sur le Tigre et l'Euphrate. *Bull.* Comité de l'Asie Franç., Vol. 9, No. 104, pp. 481-484, 1909.

PINCHES, THEOPHILUS G. Discoveries in Babylonia and the Neighbouring Lands. *Journal* of the Trans. of Victoria Inst., Vol. 46, pp. 99-121, 1909.

Central Asia

HAYDEN, H. H. The Geology of the Provinces of Tsang and Ü in Central Tibet. *Memoirs* of the Geol. Surv. of India, Part 2, Vol. 36, 80 pp., Maps, Ills., Profiles, and 2 Indexes. Calcutta, 1907.

China

—— L'enseignment étranger en Chine. Pas de méthode- pas de résultat. *Bull.* Comité de l'Asie Franç., Vol. 9, No. 104, pp. 475-481, 1909.

India

HOLLAND, SIR. T. H. General Report of the Geological Survey of India for the Year 1908. *Records* of the Geol. Surv. of India, Vol. 38, Part 1, pp. 1-70, Calcutta, 1909.

HOLLAND, SIR. T. H. The Mineral Production of India during 1908. *Records* of the Geol. Surv. of India, Vol. 38, Part 1, Calcutta, 1909.

KRAUS, DR. PROF. ALOIS. Zweiter Reisebericht aus Ceylon und Vorder-Indien. *Mitt.* der Geog. Gesells. in Hamburg, Vol. 24, pp. 1-30, 1909.

Indo-China

GODCHAUX, G., AND J. HOGGE-FORT. Les pays d'avenir. L'Indo-Chine française. *Bull.* Soc. Belge d'Études Col., Vol. 16, Nos. 3, 7-8, and 11, 1909.

TIXIER, CAPT. Note sur l'orographie de l'Indo-Chine française. (Commission de délimitation entre l'Indo-Chine et le Siam.) Sketch Maps. *La Géog.*, Vol. 20, No. 6, pp. 338-345, 1909.

Japan, Persia

GEERLIGS, H. C. PRINSEN. Formosa (4th Article in the "De Rietsuiker-Industrie in de verschillende landen van productie" Series). Map. *De Indische Mercuur*, Vol. 33, No. 1, pp. 3-4, 1909.

—— Ressources économiques de la Perse. *Bull. Union* Géog. du nord de la France, Vol. 30, Trim. 3, pp. 155-160, Douai, 1909.

Malay Archipelago

NIEUWENHUIS, PROF. DR. A. W. Der Gebrauch von Pfeil und Bogen auf den Grossen Sunda-Inseln. Ills. *Intern. Archiv für Ethnographie*, Vol. 19, No. 3, pp. 55-81, 1909.

Philippine Islands

ADAMS, GEORGE I. Geological Reconnaissance of the Island of Leyte, with Notes and Observations on the Adjacent Smaller Islands and Southwestern Samar. Map. *Philippine Jour. of Sci.*, Vol. 4, No. 5, pp. 339-356, Manila, 1909.

BEAN, ROBERT B., AND FREDERICO S. PLANTA. Filipino Types: Racial Anatomy in Taytay. Ills. *Philippine Jour. of Sci.*, Vol. 4, No. 5, pp. 359-446, Manila, 1909.

—— Catalogue of Philippine Earthquakes, 1890-1907. *Bulls.* for 1908, Manila Central Observatory, Manila, 1909.

—— Submarine Seismic Centers near the Coasts of Northern Luzon. *Bull.* for May, Weather Bureau, Manila Observatory, pp. 167-169, Manila, 1909.

AUSTRALASIA AND OCEANIA

BELL, DR. J. MACKINTOSH. The Physical Features of New Zealand. Ills. *Bull.* Geog. Soc. of Philadelphia, Vol. 8, No. 1, pp. 1-16, 1910.

CHRISTIAN, F. W. Rarotonga and the Eastern Pacific. *United Empire*, Vol. 1, No. 1, pp. 35-42, 1910.

EMERSON, NATHANIEL B. Unwritten Literature of Hawaii. The Sacred Songs of the Hula. *Bull.* 38, Bureau Amer. Ethnol., 288 pp., Ills. and Index, Washington, 1909.

GIBSON, CHAS. G. The Geological Features of the Country lying along the Route of the Proposed Transcontinental Railway in Western Australia. *Bull.* No. 37, Geol. Surv., Western Australia, 27 pp., Map, and Ills., Perth, 1909.

MARSHALL, P. The Commercial Geography of New Zealand. Maps, Ills. and Diagram. *Bull.* of the Geog. Soc. of Philadelphia, Vol. 8, No. 1, 1910, pp. 17-31, 1910.

PARK, JAMES. The Geology of the Queenstown Subdivision, Western Otago Division. *Bull.* 7, New Zealand Geol. Surv., 112 pp., Maps, Plans, and Ills., Wellington, 1909.

WARBURG, DR. Kautschuk und Guttapercha. Stand des Unternehmens in Neu-Guinea. *Verhandl.* des Kol.-Wirtschaftl. Komitees, No. 2, pp. 34-38, 1909.

WERNER, DR. E. Bilder aus Neu-Guinea. Ills. *Deutsche Kolonialz.*, No. 52, pp. 870-71, 1909, and No. 1, pp. 4-6, 1910.

—— Annual Progress *Report* of the Geological Survey of Western Australia, for 1908. 3 Maps. 21 pp., Perth, 1909.

EUROPE

BOURGEOIS, H. Ethnographie européenne. *Bull.* Soc. R. Belge de Géog., Vol. 33, Nos. 4 and 5, 1909.

Austria-Hungary

HAUPTMANN, DR. LUDMIL, AND DR. FRANZ HERITSCH. Die eiszeitliche Vergletscherung der Bösensteingruppe in den Niederen Tauern. Map and Ills. *Sitzungsber.* k. Akad. der Wissensch., Vol. 117, No. 4, Part 1, pp. 405-437, Vienna, 1908.

LUCERNA, DR. ROMAN. Glazialgeologische Untersuchung der Liptauer Alpen. Map and Ills. *Sitzungsber.* der k. Akad. d. Wissensch., Vol. 117, No. 7, Part 1, pp. 713-818, Vienna, 1908.

OBST, DR. ERICH. Die Oberflächengestaltung der schlesisch-böhmischen Kreide-Ablagerungen. Map and Ills. *Mitt.* der Geog. Gesellsch. in Hamburg, Vol. 24, pp. 85-191, 1909.

SAWICKI, DR. LUDOMIR R. v. Physiographische Studien aus den West-Galizischen Karpathen. Maps and Profiles. *Geog. Jahresbericht aus Österreich,* Vol. 7, pp. 69-96, Vienna, 1909.

STUMMER, DR. EDUARD. Niederschlag, Abfluss und Verdunstung im Marchgebiete. *Geog. Jahresbericht aus Österreich,* Vol. 7, pp. 1-3, Vienna, 1909.

Balkan States

FRECH, PROF. DR. FRITZ. Geologische Forschungsreisen in Nordalbanien nebst vergleichenden Studien über den Gebirgsbau Griechenlands. Ills. and Sketch Map. *Mitt.* der k. k. Geog. Gesells. in Wien, Vol. 52, No. 12, pp. 619-658, 1909.

—— List of Works in the New York Public Library Relating to the Near Eastern Question and the Balkan States, Including European Turkey and Modern Greece. *Bull.* of the New York Pub. Lib., Vol. 14, No. 1, pp. 7-55, 1910.

France

BUGARD, REAR ADMIRAL. Rochefort-sur-Mer. Ses rades et son port. *Bull.* de la Soc. de Géog. de Rochefort, Vol. 31, No 3, pp. 156-166, 1909.

GUÉRIN-GANIVET, J. Notes préliminaires sur les Gisements de Mollusques comestibles des Côtes de France. L'île aux Moutons et l'archipel des îles de Glénan. Map. *Bull.* de l'Instit. Océanogn., No. 154, 15 pp., Monaco, 1909.

LE MENÉ, JH-M. Les Sépultures dans le Morbihan. *Bull.* de la Soc. polymathique du Morbihan, Nos. 1 and 2, pp. 7-16, Vannes, 1908.

MARTONNE, E. DE. Contribution à l'étude du vent d'autan. Map and Diagrams. *Bull.* Soc. Languedocienne de Géog., Vol. 32, Trim. 2, pp. 135-157, 1909.

NAUZIÈRES, RAYMOND. De Mons-la-Trivalle à Héric par les Gorges. Maps and Ills. *Bull.* Soc. Languedocienne de Géog., Vol. 32, Trim. 2, pp. 158-170, Montpellier, 1909.

PERRUCHOT, L. Le mouton de France et ses produits. Map. *La Géog.,* Vol. 20, No. 6, pp. 357-367, 1909.

SORRE, MAX. Questions forestières. *Bull.* Soc. Languedocienne de Géog., Vol. 32, Trim. 1, pp. 5-24, Montpellier, 1909.

—— Port de Dunkerque. *Bull.* Union Géog. du Nord de la France, Vol. 30, Trim. 3, p. 137, Douai, 1909.

Germany and German Colonies

HALBFASS, PROF. DR. W. Der Selentersee in Ostholstein. Map. *Globus,* Vol. 96, No. 23, pp. 366-368, 1909.

LIVINGSTON, BURTON EDWARD. The Heath of Lueneburg. Ills. *The Plant World,* Vol. 12, No. 10, pp. 231-237, 1909.

SOSKIN, DR. S. Ölpalmenkultur. *Verhandl.* des Kol.-Wirtschaftl. Komitees, No. 2, pp. 30-33, Berlin, 1909.

WOHLTMANN, PROF. DR. Tabakbau, Kakao-und Kaffeekultur in den deutschen Kolonien. *Verhandl.* des Kol.-Wirtschaftl. Komitees, No. 2, pp. 45-48, 1909.

—— Die deutschen Kolonien im Reichshaushaltsetat 1910. *Kolon. Zeitsch.,* Vol. 10, No. 24, pp. 471-377, 1909.

—— *Zeitschrift* des Königlich Preussischen Statistischen Landesamts. 4 Parts. Vol. 94, Kgl. Statistisches Landesamt, Berlin, 1909.

Great Britain

HARDY, MARCEL. Caledonia Rediviva. [Suggestions as to lines of bio-geographical study in Scotland.] *Scott. Geog. Mag.*, Vol. 26, No. 1, pp. 17-25, 1910.

WEST, GEORGE. A Comparative Study of the dominant Phanerogamic and Higher Cryptogamic Flora of Aquatic Habit, in Three Lake Areas of Scotland. *Proceedings* of the Royal Soc. of Edinburgh, Vol. 25, Part 2, pp. 967-1023, 1905, and Vol. 30, Part 2, pp. 65-182, 1909-10.

Italy

SAWICKI, DR. L. RITTER V. Un profilo morfologico attraverso l'Appennino. Ills. *Rivista Geog. Ital.*, Vol. 26, No. 6, pp. 313-365, 1909.

—— Bollettino delle Pubblicazioni Italiane. [Monthly.] Biblioteca Nazionale Centrale di Firenze, 1909.

—— Statistica delle cause di Morte nell' anno 1907. Direzione Gen. della Statistica, Min. di Agric., Rome, 1909.

Russia

BOLDT, R. Organisierte Heimatsforschung, einige Erfahrungen aus Finland. Map. *Meddelanden* af Geografiska Föreningen i Finland, No. 8, pp. 1-29, Helsingfors, 1909.

MOTAWETZ-DIERKES, LÉOPOLDINE DE. La Finlande- Le Pays des mille Lacs. *Bull.* Soc. normande de Géog., 2e trimestre, pp. 45-75, Rouen, 1909.

ROSBERG, J. E., AND OTHERS. L'enseignement de la géographie en Finland. *Meddelanden* af Geografiska Föreningen i Finland, No. 8, 1907-09, pp. 1-21 (sep. pagination), Helsingfors, 1909.

ZUROWSKI, ANDREI. *Iz byta i kulta Archangelskich Samoyedov.* [Samoyeds in Archangel Gov.] Ills. *Izwiestiia* Archangel Soc. for the Exploration of Northern Russia, Vol. 1, Nos. 14 and 15, 1909.

POLAR REGIONS

MACHAT, J. The Antarctic Question—Voyages to the South Pole since 1898. Map. *Annual Report* Smithsonian Institut., pp. 451-480, 1910.

ISLANDS OF THE INDIAN OCEAN

WERTH, DR. EMIL. Zur Oberflächengestaltung der Insel Kerguelen. Map, Profile and Ills. *Zeitschrift* d. Gesells. f. Erdkunde zu Berlin, No. 10, pp. 643-676, 1909.

ANTHROPOLOGY

FEWKES, J. WALTER. Prehistoric Ruins of the Gila Valley. Ills. *Smithsonian Miscell. Collec.*, Vol. 5, Part 4, Pub. No. 1872, pp. 403-436, Washington, 1910.

LULL, SWANN. Restoration of Paleolithic Man. Ill. *Amer. Jour. of Sci.*, Vol. 29, No. 170, pp. 171-172, 1910.

BIBLIOGRAPHY

THORBECKE, F. Register zu den Ersten 10 Jahrgängen 1895-1904. [Index to *Geographische Zeitschrift*], 118 pp., Leipzig, 1909.

BIOLOGY

MACDOUGAL, D. T. Influence of Aridity upon the Evolutionary Development of Plants. *The Plant World,* Vol. 12, No. 10, pp. 217-231, Tucson, 1909.

ECONOMIC GEOGRAPHY

VOEIKOF, A. *Cheloviek i Voda: sposoby polzovania vodoyu i ich geograficheskoiie raspredielenie.* [Man and Water: Uses of Water and their Geographical Distribution.] Ills. *Izviestiia* I. Russian Geog. Soc., Vol. 45, Nos. 1-3, pp. 73-120, 1909.

VOEIKOF, A. La Géographie de l'alimentation humaine. *La Géog.,* Vol. 20, Nos. 4 and 5, pp. 225-240 and 281-296, 1909.

—— Supply and Distribution of Cotton for 1909. *Bull.* 106, Bureau of the Census, 32 pp., Washington, 1909.

HISTORICAL GEOGRAPHY AND BIOGRAPHY

DURRIEUX, DR. ALCÉE. L'œuvre scientifique de l'explorateur Edouard Foa. *Bull.* de la Soc. de Géog. d'Alger et l'Afrique du Nord, Vol. 14, Trim. 3, pp. 293-318, 1909.

RADLOFF, DR. W. Alttürkische Studien. *Izviestiia* Imp. Academy of Sciences, No. 18, pp. 1213-1233, St. Petersburg, 1909.

MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY

RABOT, CHARLES. Résolutions du Comité international de la carte du monde au 1,000,000e. *La Géog.,* Vol. 20, No. 6, pp. 368-373, 1909.

—— Méthode de Levés topographiques. *Bull.* Soc. de Topographie de France, Vol. 33, Nos. 5-6, pp. 85-93, 1909.

—— The New Compass Card. Dep. of the Navy, Bureau of Equipment, 3 pp., Washington, 1909.

PHYSICAL GEOGRAPHY

ARLDT, TH. Paläogeographie und Seismologie. *Geog. Zeitsch.,* Vol. 15, No. 12, pp. 674-684, 1909.

CONRAD, DR. VIKTOR. Beschreibung des seismischen Observatoriums der k. k. Zentralanstalt für Meteorologie und Geodynamik in Wien. *Mitt.* der Erdbeben-Kommission, Kais. Akad. d. Wissensch. in Wien, No. 33, 28 pp., 4 Ills., 1909.

MACDOUGAL, DR. D. T. Origination of Self-Generating Matter and the Influence of Aridity upon its Evolutionary Development. Ills. Reprint from the *Jour. of Geol.,* Vol. 17, No. 7, pp. 603-622, 1909.

SCHOTT, PROF. DR. Gerhard and Schu, Fritz. Die Wärmeverteilung in den Tiefen des Stillen Ozeans. 15 Maps. *Annalen* d. Hydrog. u. Marit. Meteor., Vol. 38, No. 1, pp. 2-25, 1910.

ZAHN, DR. GUSTAV W. VON. Die zerstörende Arbeit des Meeres an Steilküsten. Ills. *Mitt.* der Geog. Gesells. in Hamburg, Vol. 24, pp. 192-284, 1909.

—— Observations faites à la station météorologique de Kharbin en 1898-1906. Map and Ills. [In French and Russian.] *Observations Météor. en Mandchourie,* No. 1, 89 pp., St. Petersburg, 1909.

—— Observations météorologiques et magnétiques des stations de 1 ordre, observations extraordinaires des stations de 2 ordre et observations des stations de 3 ordre. Année 1906. *Annales* de l'Observatoire phys. central Nicolas, St. Petersburg, 1909.

GENERAL

BRÜCKNER, EDUARD. Über de Heranbildung der Geographielehrer an der Universität. *Geog. Zeitsch.*, Vol. 15, No. 12, pp. 665-674, 1909.

SANDER, DR. LUDWIG. Tropenhygiene. *Deutsche Kolonialz.*, Vol. 27, No. 2, pp. 17-18, 1909.

WEICHERT, E. Our Present Knowledge of the Earth. *Annual Report* Smithsonian Instit., pp. 431-449, 1908.

NEW MAPS

NORTH AMERICA

NORTH AMERICA. (a) Miocene in North America; (b) Eocene-Oligocene in North America. 1 inch=900 miles. By Bailey Willis. *Jour. of Geol.*, Vol. 17, No. 6, Chicago, 1909. [A black map illustrating "Paleographic Map of North America" by Mr. Willis.]

UNITED STATES GEOLOGICAL SURVEY MAPS

ALASKA. The following black maps appear in "Mineral Resources of Alaska, 1908," *Bull.* 379, 1909: (a) Relief Map of Central Alaska showing Distribution of Mineral Resources. 1 inch=110 miles; (b) Geologic Map of Kasaan Peninsula, Prince of Wales Island. 1 inch=1.5 mile. [Symbols for rock formations, productive mines, and prospects]; (c) Geologic Map of Copper Mountain Region, Prince of Wales Island. 1 inch=1.6 mile; (d) Preliminary Map showing Mineral Resources of Prince William Sound Region and Adjacent Territory from Resurrection Bay to the Copper River Delta. 1 inch=10.1 miles; (e) Map of Southwestern Alaska [Alaska Peninsula] showing Distribution of Known Mineral Deposits. 1 inch=*ca* 70 miles; (f) Geologic Sketch Map of Cook Inlet Region. 1 inch=50.1 miles; (g) Geologic Map of Herendeen Bay Coal Field. 1 inch=4.2 miles; (h) Geologic Map of Coal Harbor Coal Field, Unga Island. 1 inch=4.5 miles; (i) Map of the Region of the Wrangell and Nutzotin Mts. 1 inch=14 miles [shows distribution of copper and gold]; (j) Geologic Map of Fairbanks District. 1 inch=2.6 miles; (k) Map Showing Distribution of Mineral Resources in Iron Creek Region, Seward Peninsula. 1 inch=3.2 miles.

CALIFORNIA AND NEVADA. General Map Showing Approximate Location of Better Known Springs in the Mohave and Adjacent Deserts, in S. E. Cal. and S. W. Nevada. 1 inch=18 miles. With "Some Desert Watering Places in Southeastern California and Southwestern Nevada" by Walter C. Mendenhall. Water Supply Paper 224, 1909.

UNITED STATES. (a) Map of the United States, showing areas covered by Geologic Surveys. 1 inch=225 miles; (b) Map of U. S., showing areas covered by Topographic Surveys and the scale employed for each area. 1 inch=225 miles. With Thirtieth *Ann. Rep.* of the Director of the U. S. Geol. Surv., Fiscal year ending June 30, 1909. [The special information in red.]

UNITED STATES. (a) General Geological Map of Birmingham Valley, Ala., Showing Distribution of Formations and location of Mines and Prospects. 1:125,000=1.9 miles to an inch. Interval, 50 feet. [Geologically colored]; (b)

Map of Birmingham District, Ala., showing outlines and relations of iron ore, coal, limestone and other economic Features. 1 inch=7 miles; (c) Geologic Map of Woodstock Brown Ore Area, Ala. 1 inch=13.7 mile. With *Bull.* 400, "Iron Ores, Fuels and Fluxes of the Birmingham District, Ala.," by E. F. Burchard and C. Butts, Washington, 1910.

UNITED STATES. (a) Geographic Distribution of Producer-Gas Power Plants, based on number of installations in any locality. (b) The same based on horse power installations in any locality. Scale, 1 inch=94 miles. [Black symbols for information required. Illustrate *Bull.* 416, 1909.]

COAST AND GEODETIC SURVEY MAPS

ALASKA. Lines of Equal Magnetic Declination and of Equal Annual Change in Alaska for 1910. 1:7,000,000=110 miles to an inch. 48°-70° N.; 112°-156° W. With "Distribution of the Magnetic Declination in Alaska and adjacent regions for 1910," by R. L. Faris, Coast and Geod. Surv., Terrestrial Magnetism, Appendix 4, *Rep.* for 1909, Washington, 1910. [Red lines of Declination are drawn for each degree. Blue lines show annual rate of change in position of north end of the compass needle.]

HYDROGRAPHIC OFFICE CHARTS

Pilot Chart of the South Atlantic Ocean, March, April and May, 1910.

Pilot Chart of the South Pacific Ocean, March, April and May, 1910. [On the reverse is a Circumpolar Chart of the Southern Hemisphere on a meridional scale of 420 nautical miles to an inch. Discoveries of Antarctic lands are noted, the coast of Wilkes Land, as mapped by Wilkes, is indicated, and 13 symbols show the northern ice limits for each month in the year and the ice barrier for given months. An inset diagram denotes the periods passed by exploring vessels south of the 60th parallel.]

Pilot Charts of the North Pacific Ocean, March and April, 1910. [The chart for March prints on the reverse, the paper by Mr. G. W. Littlehales, "The Disproof of the Existence of Reed or Redfield Rocks," which appeared in the *Bulletin* for Sept., 1904.]

Pilot Chart of the North Atlantic Ocean, March, 1910.

DEPARTMENT OF AGRICULTURE MAPS

UNITED STATES. Soil Survey Maps of Bibb and Cullman Cos., Ala.; the Pajaro Valley, Cal.; Allen Co., Ind.; Livingston Co., N. Y.; The Klamath Reclamation Project, Ore. 1 inch=1 mile and 1 inch=0.9 mile. [In colors, with contours of elevation. Each map accompanied by descriptive text.]

CALIFORNIA. Eight maps of counties showing boundaries of National Forests. The counties are: El Dorado, Madera, Placer, Shasta, Sierra, Siskiyou, Trinity and Tuolumne. No scale. Compiled from data supplied by the U. S. Forest Service. State Mining Bureau, Lewis E. Aubury, State Mineralogist, San Francisco, 1909. [Boundaries and names of National Forests in red. The omission of map scales is regrettable.]

MISSOURI. The following colored maps appear in "Geology of the Disseminated Lead Deposits of St. Francois and Washington Counties, Mo." Missouri Bureau of Geology and Mines, Vol. 9, Parts 1 and 2, Jefferson City, 1909: (a)

Geological Map of Southeastern Missouri, Showing Area Covered by this Report. 1 inch=4 miles. E. R. Buckley, Director and State Geologist. [10 colored symbols for rock formations]; (b) Geologic and Topographic Map, Bonne Terre Sheet. 1:62,500=0.9 mile to an inch. Contour interval 20 feet. Geology by E. R Buckley; (c) Geological Map of the Flat River—Leadwood Areas. 1 inch= 0.4 mile. Contour interval, 10 feet; (d) Geological Map of the Bonne Terre Area. 1 inch=0.37 mile. Interval, 20 feet.

MISSOURI. Geological Map of Morgan County. 1 inch=0.75 mile. By C. F. Marbut. In colors. Missouri Bureau of Geology and Mines, Vol. 7, 2nd Series, Jefferson City, Mo. No date. [13 colored symbols for rock formations.]

MISSOURI. Geological Map of Pine County, Mo. 1 inch=0.75 mile. By R. R. Rowley. Missouri Bureau of Geology and Mines, Vol. 8, 2nd Series, Jefferson City, Mo. No date.

MEXICO. (a) Plano Puerto de Coatzacoalcos. 1:10,000; (b) Salina Cruz. Obras del Puerto. 1:6,000. With "El Ferrocarril nacional de Tehuantepec y los Puertos de Coatzacoalcos y Salina Cruz," by Civil Engineer Gabriel M. Oropesa. In *Memorias y Revista* de la Sociedad Cientifica "Antonio Alzate." Tomo 25. Nos. 9 á 12, Federal Government, Mexico City, 1909. [Black plans of these terminal ports of the Tehuantepec R.R.]

SOUTH AMERICA

BRITISH GUIANA. Map of British Guiana. 1 inch=50 miles. 1°-8° 50′ N.; 56° 10′-61° 30′ W. Compiled from the most recent Surveys in the Department of Lands and Mines. With "Handbook of British Guiana, 1909," Permanent Exhibitions Comm., Georgetown, 1908. [A colored map showing ocean and land steam routes, roads, postoffices and government stations, Indian reservations, and rubber, gold and diamond areas.]

CHILE. Travaux géodésiques au Chili. 1:5,000,000=78.9 miles to an inch. With *"Rapport* sur les Travaux géodésiques au Chili" by Luis Riso-Patron. [Shows geodetic net work. The paper and map were presented at the 16th Meeting of the International Geodetic Association in London, September, 1909.]

LAKE TITICACA. (a) Cortes del Lago Titicaca. [Six profiles of the lake, the vertical scale for depths being a 50-fold exaggeration of the horizontal scale.] (b) Mapa Batimetrico del Lago Titicaca. 1:825,000. Mission G. de Gréqui Montfort y E. Sénéchal de La Grange. Edited by Dr. Neveu-Lemaire. [4 colored symbols for depths. The maps illustrate "Los Lagos de los Altiplanos de la América del Sud" by Dr. M. N. Lemaire. Spanish translation by Dr. B. D. Romero. Dirección General de Estadística y Estudios Geográficos, La Paz, 1909.]

AFRICA

GERMAN SOUTHWEST AFRICA. Stadtplan von Windhuk. No scale. *Deutsche Kolonialz.* Vol. 27, No. 7, Berlin, 1910.

SAHARA. (a) In Ghar; (b) Tit; (c) Aoulef-Timokten; (d) Akabli; (e) In Belbel et Matriouen. Scales, 1:100,000 and 1:50,000. With "Le Tidikelt" by L. Voinot. *Bull. Trim.* de la Soc. de Géog. et d'Arch. d'Oran, Vol. 29, No. 4, Oran, 1909. [Black sketch maps of oases in Tidikelt.]

TRANSVAAL COLONY. Map of the Transvaal Colony. 1 inch=30 miles. Compiled in the Surveyor General's Office, Pretoria, 1902; revised Jan., 1909. With *Report* of the Geol. Surv. for 1908. Pretoria, 1909. [Shows, in colors areas surveyed up to the end of 1907 and those completed during 1908.]

ASIA

CENTRAL ASIA. Dr. Aurel Stein's Routes in 1906-08. (In Hungarian.) 1:4,000,000=63.16 miles to an inch. 34°-44° N.; 74°-101° E. *Bull.* Hungarian Geog. Soc., Vol. 37, No. 8, Budapest, 1909. [In colors, with routes in red.]

CHINA AND TIBET. Weg der Expedition Filchner in China u. Tibet. 1:6,000,000=94.6 miles to an inch. With "Wissenschaftliche Ergebnisse der Expedition Filchner nach China u. Tibet, 1903-5. Band 10, Teil 1. Abschnitt 1: Zoologische Sammlungen; Abschnitt 2: Botanische Sammlungen. Mittler & Sohn, Berlin, 1908.

THE PHILIPPINES. Reconnaissance Map of the Geologic Districts of Leyte. 1 inch=22 miles. With paper "Geological Reconnaissance of the Island of Leyte, etc.," by George I. Adams. *Phil. Jour. of Sci.,* Vol. 4, No. 5, Manila, 1909. [Colors show different formations.]

TIBET. Geological Map of parts of the Province of Tsang and Ü in Tibet. 1 inch=8 miles. With "The Geology of the Provinces of Tsang and Ü in Central Tibet," by H. H. Hayden, Supt. Geol. Surv. of India. *Memoirs* Geol. Surv. of India, Vol. 26, part 2, Calcutta, 1907. [8 tints for geological formations. The map shows the results of the traverse made through a considerable part of Central Tibet on the Younghusband expedition to Lhasa.]

AUSTRALASIA AND OCEANIA

WESTERN AUSTRALIA. Geological Sketch Map of the Country along Route of proposed Transcontinental Railway. 1 inch=20 miles. 30°-33° S.; 121°-129° 15′ E. By C. G. Gibson. With *Bull.* 37, same title, of the Geol. Surv. of Western Australia, Perth, 1909.

NEW ZEALAND. The following maps, in colors, appear in "The Geology of the Mikonui Subdivision, North Westland," *Bull.* No. 6, New Series, New Zealand Geological Survey, Wellington, 1908: Topographical and Geological maps, 1 inch=1 mile, of the (a) Waitaha, (b) Toaroha, (c) Mount Bonar and Parts of Wanganui and Poerua, (d) Totara, and (e) Whitcombe Pass and Portions of Poerua and Butler Survey Districts. James Mackintosh Bell, Director, Geological Survey. [Excellent maps, giving a large variety of information.]

DUTCH NEW GUIANA. (a) Overzicht der ontdekkingen in Ned. Nieuw-Guinea tot begin 1908. 1:3,000,000; (b) Kaarten van Zuidwestkust van Nieuw-Guinea. Various scales. [Six sketch maps showing results of coast surveys and soundings]; (c) Etna Baai. 1:75,000. 3° 54′-4° 5′ S.; 134° 5′-134° 57′ E. [Geological coloring, with soundings and nature of coasts]; (d) Rivierverkenningen in Z. W. Nieuw-Guinea. Oetakwa of Tania R (5° S.; 137°-13′ E.) and an unnamed river (5°-16° S.-137° 40′ E.) Scale of river lengths, 1:100,000; breadths, 1:40,000. By Capt. E. J. de Rochemont, Sept.-Oct., 1904. [Showing depths and kinds of vegetation along river banks. These rivers have not been indicated, hitherto.] (e) Digóel Rivier, 1:200,000. By R. Posthumus Meyjes,

March and April, 1905. [A detailed black map of the entire course of the river, with soundings and nature of vegetation along the banks.] (f) Zuidwestkust Nieuw-Guinea, 1:1,000,000. 3°-8° 30′ S.; 134° 30′-141° E. [Colored map collating all the survey work of the Southwest New Guinea Expedition, 1904-5 of the Royal Dutch Geographical Society. These maps illustrate "De Zuidwest Nieuw-Guinea Expeditie, 1904-5, van het Kon. Ned. Aardrijkskundig Genootschap," E. J. Brill, Leyden, 1908.]

EUROPE

AUSTRIA-HUNGARY. Das Tatragebirge. Einteilung und Verteilung der mittleren Höhe. 1:300,000=4.73 miles to an inch. With paper "Einteilung und Orometrie des Tatragebirges nebst einem Beitrag zur Wald-und Knieholzgrenze." By A. Holle. In *Abhandlungen* k. k. Geog. Gesells. in Wien, Vol. 8, No. 2, Vienna, 1909. [Curves of elevation, with 200 meters interval and superimposed transparent sheet with contours showing heights at which timber and scrub grow.]

AUSTRIA-HUNGARY. (a) Schi-Routenkarte der Niederösterr.-Steirischen Kalkalpen. 1:100,000=1.5 mile to an inch. (b) Schi-Routenkarte des Ob. Ennstales u. d. Rottenmanner Tauern. 1:100,000. G. Freytag & Berndt, Vienna, 1909. Paper, K. 2, Linen, K 2.80. [Two of the superior tourist maps of this firm showing in red the ski routes and those adapted only for climbing, refuge huts, mountain hotels, forests and much other information.]

AUSTRIA-HUNGARY. G. Freytags Verkehrs-Karte von Österreich-Ungern. 1910. 1:500,000=23.67 miles to an inch. G. Freytag & Berndt, Vienna, 1910. Paper, K 2.40. [This annually revised map gives the fullest information on transportation in the Empire. An inset shows the connection of the imperial railroad system with that of the Balkan States and Turkey. An index to all railroad stations (52 pp.) refers to index letters and numerals on the map margin.]

FRANCE. Gorges d'Héric. No scale. Illustrates "De Mons-la-Trivalle à Héric," by Raymond Nauzières in *Bull.* Soc. Languedocienne de Géog., Vol. 32, p. 158, Montpellier, 1909.

FRANCE. Rochefort et ses Rades. No scale. *Rev. Franc.*, Vol. 35, p. 85, Paris, 1910. [A black sketch showing soundings and other conditions of the harbor.]

ITALY. Die Veränderungen am Vesuv in Folge des Ausbruchs vom April 1, 1906. Three black maps and 4 profiles on various scales. With paper of same title by G. Greim in *Geog. Zeitsch.*, Vol. 16, No. 1, Leipzig, 1910.

LONDON. Environs. Contoured Map of London. 1 inch=1 mile. John Bartholomew & Co., Edinburgh, 1909. Folded in paper cover, 1s. [A revised edition of this fine map which has 9 tints for contours of altitude. As the different kinds of roads are differentiated, the map is especially convenient for motorists, cyclists and pedestrians.]

EAST INDIES

DUTCH EAST INDIES. Schetskaart van de Ostkust van het Nordelijk Schiereiland van Halmahera. 1:300,000=473 miles. By Lieut. G. J. J. de Jongh. With

paper "De Oostkust van Noord-Halmahera." *Tijdschrift* of the Royal Netherlands Geog. Soc., Vol. 26, No. 5, Amsterdam, 1909. [Only short sections of the west coast of this peninsula have yet been surveyed.]

DUTCH EAST INDIES. Overzichtskaart van den Indischen-Archipel. 1:6,000,000=94.6 miles. With paper "De Staatkundige Indeeling van Nederlandsch-Indië." *Tijdschrift* Royal Netherlands Geog. Soc., Vol. 26, No. 5, Amsterdam, 1909. [A colored map defining the administrative districts, posts of government officials and much other political information.]

DUTCH EAST INDIES. De Vaarwaters naar Soerabaja. 1:300,000=4.73 miles to an inch. By J. E. de Meyier. 5 Maps in colors and 6 profiles on 2 sheets. Illustrates "De vaarwaters naar Soerabaja en den loop der tijden." *Tijdschrift* Royal Netherlands Geog. Soc., Vol. 27, No. 1, Amsterdam, 1910. [Contours of depths and many soundings in meters in the strait of Soerabaja and its approaches as observed at different periods between 1843 and 1908. This strait separates the island of Madoera from Java.]

OCEANS

ATLANTIC AND MEDITERRANEAN. Campagne scientifique de la "Princesse Alice" du 27 Avril au 12 Septembre, 1909. No scale. *Bull.* 157, l'Institut océanographique, Monaco, 1910. [A black map showing route, stations and soundings from Monaco-Gibraltar-Atlantic-English Channel to mouth of the Elbe.]

MEDITERRANEAN. Environs de Monaco. Carte provisoire des Opérations effectuées par l'Eider et le Sténo en 1907-1909. 1 inch=4,250 feet. Illustrates *Bull.* 160, l'Institut océanographique, Monaco, 1910. [Shows soundings and contours of sea floor from Point Mortola to Cape Antibes.]

GEODETIC MAPS

MAPS OF GEODETIC OPERATIONS FOR MEASURING ARCS OF THE MERIDIAN. The following maps appear in "La Figure de la Terre," by Captain G. Perrier (Revue de Géog. annuelle, Tome 2, 1908):

Lapland. Arc de Laponie. 1 inch=25 miles.

Europe. Croquis de l'Europe. 1:15,000,000. [Shows the European network of Geodetic work and the arcs of the meridian measured.]

South America. Croquis de l'Équateur et des régions limitrophes de la Colombie et du Pérou. 1:3,000,000. [Relates to the geodetic and gravity work of the missions of 1735-44 and 1899-1906.]

Ecuador. Nouvelle méridienne de Quito. 1:3,000,000.

Spitzbergen. Arc du Spitzberg. 1 inch=59 miles.

North America. Principaux arcs de l'Amérique du Nord. 1 inch=1,100 miles.

ATLASES

Missionary Atlas showing the Foreign Mission Fields of the Methodist Episcopal Church. Board of Foreign Missions of the M. E. Church, New York, 1909. [31 plates in colors, with places occupied by M. E. missionaries underlined in red.]

OTHER ACCESSIONS

NORTH AMERICA

BICKNELL, THOMAS W. Sowams. With Ancient Records of Sowams and Parts Adjacent. Illustrated. New Haven, Conn., Assoc. Pubs. of American Records. 1908.

BIOLLEY, PAUL. Costa Rica and Her Future. Translated from the French by Cecil Charles. Map. Washington, D. C., Judd & Detweiler, Prts. 1889. 8vo.

BOND, J. WESLEY. Minnesota and its Resources, etc. [Map.] New York, Redfield. 1853. 12mo.

BRAMAN, D. E. E. Braman's Information About Texas. Carefully Prepared. Philadelphia, J. B. Lippincott & Co. 1857. 12mo.

DUNCAN, JOHN M. Travels through part of the United States and Canada in 1818 and 1819. 2 Vols. [Maps.] Glasgow, Hurst, Robinson & Co. 1823. 8vo.

FALCONER, THOMAS. The Oregon Question; or, A Statement of the British Claims to the Oregon Territory, etc. 2nd Edition. London, Samuel Clarke. 1845. 8vo.

FERNÁNDEZ, LÉON. Historia de Costa Rica durante la Dominación Española. 1502-1821. [Plate and Autograph Facsimiles.] Madrid, Tip. de M. G. Hernández. 1889. 8vo. pr. *Gift.*

FERRIS, JACOB. The States and Territories of the Great West, etc. Map, etc. New York & Auburn, Miller, Orton & Mulligan. 1856. 8vo.

GORDON, THOMAS F. History of Pennsylvania, from its Discovery by Europeans to the Declaration of Independence in 1776. Philadelphia, Carey, Lea & Carey. 1829. 8vo.

GUROWSKI, ADAM G. DE. America and Europe. New York, D. Appleton & Co. 1857. 12mo.

HAYDON, A. L. Canada. Britain's Largest Colony. With a Chapter on Newfoundland and Labrador. (Map), etc. New York, Cassel & Co. 1904. 8vo.

HEATH (WILLIAM). Heath's Memoirs of the American War. Reprinted for the Original Edition of 1798. With Introduction and Notes by Rufus Rockwell Wilson. *Source Books of American History* (*2*). New York, A. Wessels Co. 1904. 8vo.

INGERSOLL, ERNEST. The Crest of the Continent: a Record of a Summer's Ramble in the Rocky Mountains and Beyond. (Illustrations) [& Map]. Chicago, R. R. Donnelley & Sons. 1885. 8vo.

MACCOUN (TOWNSEND). Early New York. Half Moon Edition. [*Consisting of five folding maps.*] (New York, Townsend MacCoun, 1909.)

MILLER, JOHN. New York Considered and Improved. Published from the original MS. in the British Museum. With Introduction and Notes by Victor Hugo Paltsits. [Plans.] Cleveland, The Burrows Bros. Co. 1903. 8vo.

NORDHOFF, CHARLES. Northern California, Oregon, and the Sandwish Islands. (Maps, etc.) New York, Harper & Bros. 1874. 8vo.

NORDHOFF, CHARLES. Peninsular California. Some Account of the Climate, Soil, ... of the Northern Half of Lower California. (Maps, etc.) New York, Harper & Bros. 1888.

NORTH-WEST AMERICAN WATER BOUNDARY. Second and Definite Statement on behalf of the Government of Her Britannic Majesty, submitted to His Majesty the Emperor of Germany under the Treaty of Washington of May 8, 1871. Folio pr.

OGDEN, JOHN C. A Tour through Upper and Lower Canada. Containing a View of the Present State of Religion, . . . among the English, French, and Indian Settlements. 2nd Edition. Wilmington, Printed for the Author by Bonsal & Niles. 1800. 12mo.

PARKER, NATHAN H. The Missouri Hand-Book, etc. [Map.] Saint Louis, P. M. Pinckard. 1865. 12mo.

POPE, JOHN. A Tour through the Southern and Western Territories of the United States of North America, etc. Richmond, Printed by John Dixon. 1842. (*Reprinted, with Index, for Charles L. Woodward, New York, 1888.*) 8vo.

PRICE, ROSE LAMBART. A Summer on the Rockies. Map, etc. London, Sampson, Low, Marston & Co. 1898. 8vo.

PRUDDEN, T. MITCHELL. On the Great American Plateau. Wanderings . . . in the Land of the Cliff-Dweller, etc. (Map), etc. New York, G. P. Putnam's Sons. 1906. 8vo.

RUSLING, JAMES F. Across America: or, The Great West and the Pacific Coast. [Maps, etc.] New York, Sheldon & Co. 1874. 12mo.

SEMMES, RAPHAEL. Campaign of General Scott, in the Valley of Mexico. [Map.] Cincinnati, Moore & Anderson. 1852. 8vo.

STAFFORD, HORATIO GATES. A Pocket Guide for the Tourist and Traveller, along the Line of the Canals, etc. New York, T. & J. Swords, Prts. 1824. 12mo.

TOZZER, ALFRED M. A Comparative Study of the Mayas and Lacandones. *Archaeological Institute of America. Report of the Fellow in American Archaeology. 1902-1905.* (Illustrations.) New York, The Macmillan Co. 1907. 8vo. pr.

TRUMAN, BEN. C. Semi-Tropical California: its Climate, etc. San Francisco, A. L. Bancroft & Co. 1874. 8vo.

SOUTH AMERICA

CROASDAILE, HENRY E. Scenes on Pacific Shores; with a Trip Across South America. [Frontispiece.] London, Town & Country Pub. Co. 1873. 8vo.

CURTIS, WILLIAM ELEROY. Venezuela, a Land Where It's Always Summer. Map. London, Osgood, McIlvaine & Co. 1896. 8vo.

DANCE, CHARLES DANIEL. Recollections of Four Years in Venezuela. Map, etc. London, Henry S. King & Co. 1876. 8vo.

DU GRATY, ALFREDO M. La República del Paraguay. Traducida del Frances al Español por Cárlos Calvo. (Cartas, etc.) Besanzon, Imp. de José Jacquin. 1862. 8vo.

FUENTES, HILDEBRANDO. El Cuzco y sus Ruinas. [Illustrated.] Lima, Imprenta del Estado. 1905. 8vo.

GRAHAM, R. B. CUNNINGHAME. A Vanished Arcadia. Being some account of the Jesuits in Paraguay, 1607 to 1767. Map. New York, The Macmillan Co. 1901. 8vo.

TRIANA, S. PÉREZ. De Bogotá al Atlántico por la vía de los Ríos Meta,

Vichada y Orinoco. Segunda Edición. Madrid, Tip de la "Rev. de Archivos, Bibil. y Mus." 1905. 8vo. pr.

AFRICA

BENSUSAN, S. L. Morocco. Painted by A. S. Forrest. Described by ———. (22 Illustrations.) London, Adam & Charles Black. 1904. 8vo.

DENNETT, R. E. Seven Years among the Fjort, being an English Trader's Experiences in the Congo District. Map, etc. London, Sampson Low, Marston, etc. 1887. 8vo.

HILLEGAS, HOWARD C. The Boers in War. The Story of the British-Boer War of 1899-1900, etc. Map, etc. New York, D. Appleton & Co. 1900. 8vo.

MAYO, EARL OF. Sport in Abyssinia; or, The Mareb and Tackazzee. (Illustrations.) London, John Murray. 1876. 8vo.

ASIA

BROWN, ARTHUR JUDSON. The New Era in the Philippines. (Map, etc.) New York, Fleming H. Revell Co. (1903.) 8vo.

CAMPBELL, DONALD. A Journey Over Land to India, partly by a Route never gone before by any European. In a Series of Letters to his Son, etc. Philadelphia, Bartram & Reynolds, Prts. 1807. 8vo.

COLQUHOUN, ARCHIBALD R. China in Transformation. Maps, etc. New York, Harper & Bros. 1898. 8vo.

CORNWALLIS, KINAHAN. Two Journeys to Japan. 1856-7. 2 Vols. (in one). Illustrated. London, Thomas Cautley Newby. 1859. 12mo.

DEUTSCH, LEO. Sixteen Years in Siberia. Translated by Helen Chisholm. With Notes and a brief Summary of the Revolutionary Movement in Russia. Cheap Edition. (Illustrations.) London, John Murray. 1905. 8vo.

AUSTRALASIA AND OCEANIA

BRODIE, WALTER. Pitcairn's Island, and the Islanders, in 1850, etc. 2nd Edition. [Illustrated.] London, Whittaker & Co. 1851. 12mo.

FIELD, HENRY M. Our Western Archipelago. [Map], (etc.) New York, Charles Scribner's Sons. 1895. 8vo.

NEW ZEALAND. Tours & Excursions. [Maps, etc.] (New Zealand Government Tourist & Health Resorts Department.) s. a. pr. 16mo. *Gift.*

EUROPE

ALDEN (EDWARD C.) Alden's Oxford Guide. With Key-Plan of the University and City, and Numerous Engravings. 24th Thousand. Revised. Oxford, Alden & Co. (1886.) sm. 8vo. *Gift.*

BADDELEY, M. J. B. The English Lake District. *Thorough Guide Series.* Maps. 5th Edition. London, Dulau & Co. sm. 8vo. *Gift.*

BADGER, G. PERCY. A Guide to Malta and Gozo. Malta, Paolo Bonavia, Prt. 1881. sm. 8vo. *Gift.*

FALMOUTH. Pictorial and Descriptive Guide to Falmouth, the Lizard, etc. 2nd Edition. Maps, etc. London, Ward, Lock & Co. (1901.) 8vo. *Gift.*

GIGLIOLI, CONSTANCE H. D. Naples in 1799. An Account of the Revolution of 1799 and of the Rise and Fall of the Parthenopean Republic. Illustrations. New York, E. P. Dutton & Co. 1903. 8vo.

GONCOURT, EDMOND ET JULES DE. L'Italie d'hier. Notes de Voyages 1855-1856, etc. (Illustrations.) Paris, G. Charpentier et E. Fasquelle. 1894. 8vo.

LATIMER, ELIZABETH WORMELEY. France in the Nineteenth Century. 1830-1890. 8th Edition. (Illustrations.) Chicago, A. C. McClurg & Co. 1903. 8vo.

MARMIER, X. Lettres sur le Nord. Danemark, Suède, Norvège, Laponie et Spitzberg. 2 Vols. [2 Illustrations.] Paris, H. L. Delloye. 1840. 12mo.

[MARTINIÈRE, PIERRE-MARTIN DE LA]. Nouveau Voyage du Nort Dans lequel on voit les Mœurs, la Maniere de vivre, ... des Norweghiens, des Lapons, etc., etc. Par le Sr. * * *. [Illustrated.] A Amsterdam, Estienne Roger. [1671?] 12mo.

MONCRIEFF, A. R. HOPE. *Editor.* Black's Guide to Cornwall. Edited by ———. 17th Edition. Maps and Plans. London, Adam & Charles Black. 1898. 8vo. *Gift.*

MOULE, THOMAS. English Counties Delineated; or, a Topographical Description of England. 2 Vols. Maps, etc. London, George Virtue. 1839. 4to.

SMYTHE, CARLYLE. The Story of Belgium. With a Chapter on the Congo Free State. London, Hutchinson & Co. 1900. 8vo.

STEEVENS, G. W. With the Conquering Turk. Confessions of a Bashi-Bazouk. 4 Maps. New York, Dodd, Mead & Co. 1897. 8vo.

POLAR

KOOLEMANS BEIJNEN, L. R. De Tweede Reis der Pandora naar de Noordelijke Ijszee in den Zomer van 1876. Kaart. (Overgedrukt uit de Mededeelingen betr. het Zeewezen.) 'sGravenhage, De Gebroders Van Cleef. 1877. 8vo. pr.

KOOLEMANS BEYNEN, L. R. De Reis der Pandora naar de Noordpoolgewesten, in den Zomer van 1875. (Uitgegeven vanwege het Aardrijkskundig Genootschap.) [Kaart.] Amsterdam, C. F. Stenler. 1876. 8vo. pr.

VARIOUS

BARNEY, W. HENRY. The New Far West and the Old Far East, being Notes of a Tour in North America, Japan, China, Ceylon, etc. Maps, etc. London, Edward Stanford. 1889. 8vo.

DARLINGTON, WILLIAM M. Christopher Gist's Journals, etc. [Maps.] Pittsburgh, J. R. Weldin & Co. 1893. 8vo.

FOUNTAIN, PAUL. The Eleven Eaglets of the West. London, John Murray. 1905. 8vo.

HULBERT, ARCHER BUTLER. Washington and the West. Being George Washington's Diary of September, 1784, etc. And a Commentary upon the same by ———. Maps (etc.) New York, The Century Co. 1905. 8vo.

OWENS, JOHN S., AND CASE, GERALD O. Coast Erosion and Foreshore Protection. [Illustrated.] London, St. Bride's Press. (1908.) 8vo. *Gift.*

PALGRAVE, FRANCIS. A History of the Anglo-Saxons. [Illustrated.] London, Ward, Lock & Co. s. a. 8vo.

SCHUYLER, MONTGOMERY. Westward the Course of Empire, etc. Reprinted, with Additions, from the New York Times. (Illustrations.) New York, G. P. Putnam's Sons. 1906. 12mo.

STATHAM, F. REGINALD. Blacks, Boers, & British. A Three-Cornered Problem. London, Macmillan & Co. 1881. 8vo.